THE

AMERICAN NATURALIST,

A POPULAR ILLUSTRATED MAGAZINE

OF

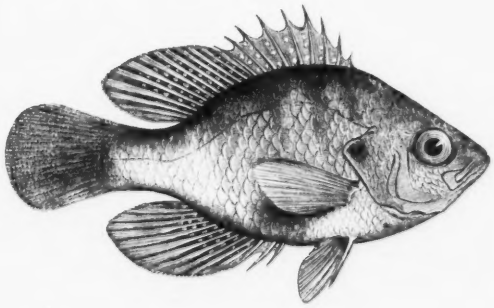
NATURAL HISTORY.

EDITED BY

A. S. PACKARD, JR., AND F. W. PUTNAM.

E. S. MORSE AND A. HYATT, ASSOCIATE EDITORS.

VOLUME IV.



SALEM, MASS.

PEABODY ACADEMY OF SCIENCE.

1871.

ESSEX INSTITUTE PRESS.

CONTENTS OF VOL. IV.

REVIEWS.

NATURAL HISTORY MISCELLANY.

LIST OF PLATES.

LIST OF WOOD-CUTS.

ERRATA.

ERRATA TO VOL. IV.—Page 63, line 16, for *pervenum* read *perversum*. Page 30, line 15, for *lips* read *hips*. Page 36, line 2, for *Arctostaphylla* read *Arctostaphyllos*. Page 103, line 9, for *H. analostanus* read *H. Kentuckiensis*. (Later, however, Cope has shown the species to be *distinct from* Kirtland's *Kentuckiensis*.) Page 117, line 13 of foot note, for *Teretribus* read *teretulus*. Page 112, line 16, for *Rariton* read *Raritan*. Page 273, the sentence beginning on line 9, should begin, "Now it is not often the case." Page 316, line 6, for *mouth* read *mantle*. Page 439, line 3 for *but one*, read *an*. Page 439, line 3, leave out the word *but* before *one instance*. Page 458, line 21, for *Lord Mondoddo* read *Lord Monboddo*. Page 468, line 7, for *it is* read *is it*. Page 468, line 13, for *possession of stars* read *procession of stars;* and in line 14, for *either* read *ether*. Page 501 under figure 100, first line, for *Apus* read *Branchipus*, and in second line, for *Branchipus* read *Apus*. On line 1 from bottom, for *cephalothorax* read *head*. Page 126, last line, for MR. DRESSER read MR. DRESLER. Page 375, line 34, for J. P. KIRKLAND read J. P. KIRTLAND. Page 651, last line, for *Zoologist* read *Zoologists*. Page 689, line 29, for *poisoning* read *poison ivy*.

Plates 3 and 4 (pp. 490, 491) should read plates 4 and 5. Plate 5 (page 637) should read Plate 6, and Plate 6 (page 687) should read Plate 7. Page 572, for figure 100, read figure 114. Page 575, for figure 100, read figure 115. Page 700, for figure 140, read 157. Page 701, for figure 141 read 158. (These corrections, however, only refer to the serial numbers of the plates and cuts, as the references in the text are to their present numbers.)

LIST OF CONTRIBUTORS TO VOL. IV.

Charles C. Abbott, M.D., Trenton, N. J.
Prof. L. Agassiz, Cambridge, Mass.
J. A. Allen, Cambridge, Mass.
W. W. Bailey, Providence, R. I.
Prof. W. J. Beal, Chicago, Ill.
Alfred W. Bennett, London (from *Quarterly Journal of Science*).
W. G. Binney, Burlington, N. J.
James H. Blake, Cambridge, Mass.
Charles B. Brigham, M.D., Boston, Mass.
Edward F. Chever, Yorkville, Ill.
Rev. J. W. Chickering, jr., Exeter, N. H.
A. S. Collins, Caledonia, N. Y.
Prof. E. D. Cope, Philadelphia, Pa.
Dr. Elliott Coues, U. S. A.
A. H. Curtis, Liberty, Va.
W. H. Dall, Washington, D. C.
Prin. J. W. Dawson, Montreal, Canada (from *Nature*).
J. H. Emerton, Salem, Mass.
J. W. Foster, LL.D., Chicago, Ill.
Prof. Theodore Gill, Washington, D. C.
J. J. H. Gregory, Marblehead, Mass.
A. Kellogg, M.D., San Francisco, Cal.
Prof. Joseph Leidy, Philadelphia, Pa.
Miss Grace Anna Lewis, Philadelphia, Pa.
Rev. S. Lockwood, Lockport, N. J.
Thomas Meehan, Germantown, Pa.
Prof. J. S. Newberry, New York, N. Y.
Dr. A. S. Packard, jr., Salem, Mass.
Rev. A. P. Peabody, D.D., Cambridge, Mass.
Prof. John L. Russell, Salem, Mass.
Capt. C. M. Scammon, U. S. N.
Prof. N. S. Shaler, Cambridge, Mass.
Hon. E. G. Squier, New York, N. Y.
Dr. Wm. Stimpson, Chicago, Ill.
H. Willey, New Bedford, Mass.
Wm. Wood, M.D., Winsor Hill, Conn.

LIST OF CONTRIBUTORS TO THE REVIEWS, MISCELLANY, ETC.

Charles C. Abbott, M.D., Trenton, N. J.
Wm. P. Alcott, North Greenwich, Conn.
J. A. Allen, Cambridge, Mass.
T. Allison, DeWitt, Iowa.
Mr. Alvord, Greenfield, Mass.
F. P. Atkinson, Cambridge, Mass.
J. L. B., Colora, Md.
Ward Bachelor, Waverly, Pa.
Prof. S. F. Baird, Washington, D. C.
F. A. P. Barnard, LL.D., New York, N. Y.
Prof. W. J. Beal, Chicago, Ill.
Edwin Bicknell, Cambridge, Mass.
Frederick Brendel, M.D., Peoria, Ill.
G. C. Broadhead, Pleasant Hill, Mo.
Robert Brookhouse, Salem, Mass.
Hon. J. D. Caton, Ottawa, Ill.
S. C. Clarke, Jamaica Plain, Mass.
J. R. Collete, Somerville, Mass.
Wm. A. Conklin, New York, N. Y.
Prof. A. J. Cook, Lansing, Mich.
Dr. J. G. Cooper, San Francisco, Cal.
Prof. E. D. Cope, Philadelphia, Pa.
Dr. Elliott Coues, U. S. A.
W. H. Dall, Washington, D. C.
R. H. Fisher, Arba, Ind.
J. H. Emerton, Salem, Mass.
Augustus Fowler, Danvers, Mass.
Charles C. Frost, Brattleborough, Vt.
Frank Gammons, West Newton, Mass.
George Gibbs, New York, N. Y.
Prof. Theodore Gill, Washington, D. C.
Henry Gillman, Detroit, Mich.
Prof. Asa Gray, Cambridge, Mass.
Edward L. Greene, Decatur, Ill.
Prof. James Hall, Albany, N. Y.
Prof. C. F. Hartt, Ithaca, N. Y.
W. J. Hays, New York, N. Y.
J. J. Higgins, M.D., New York, N. Y.
Prof. Eugene W. Hilgard, Oxford, Miss.
Thomas Hill, LL.D., Waltham, Mass.
Prof. C. H. Hitchcock, Hanover, N. H.
Robert Howell, Nichols, N. Y.
Prof. T. Sterry Hunt, Montreal, Canada.
Prof. A. Hyatt, Salem, Mass.
B. C. Jillson, M.D., Pittsburgh, Pa.
J. Matthew Jones, Halifax, N. S.
Prof. W. C. Kerr, Raleigh, N. C.
W. Kirkland, ——.
Brevet Major Gen. A. V. Kautz, U. S. A.
Prof. J. P. Kirtland, Cleveland, Ohio.
William Kite, Germantown, Phil., Pa.
Prof. O. C. Marsh, New Haven, Conn.
C. J. Maynard, Newtonville, Mass.
Thomas Meehan, Germantown, Pa.
D. Millikin, Hamilton, Ohio.
Charles S. Minot, Boston, Mass.
Prof. E. S. Morse, Salem, Mass.
H. M. Myers, Williamstown, Mass.
C. H. Nauman, Smyrna, Fla.
Dr. T. D'Oremieulx, New York, N. Y.
Prof. James Orton, Poughkeepsie, N. Y.
C. S. Osborne, Rochester, N. Y.
A. S. Packard, jr., M.D., Salem, Mass.
H. W. Parker, Grinnell, Iowa.
Dr. Henry C. Perkins, Newburyport, Mass.
Rev. J. B. Perry, Cambridge, Mass.
F. W. Putnam, M.A., Salem, Mass.
R. W. Raymond, New York, N. Y.
T. T. Richards, St. Louis, Mo.
Dr. F. J. B. Rœhmer, Mobile, Ala.
Prof. J. L. Russell, Salem, Mass.
Ira Sayles, Rushford, N. Y.
S. H. Scudder, Boston, Mass.
E. G. Squier, M.A., New York, N. Y.
Winfrid Stearns, Amherst, Mass.
Dr. R. P. Stevens, New York.
Charles Stodder, Boston, Mass.
L. J. Stroop, Waxahachie, Texas.
E. H. T——, Hindsbury, Pa.
Prof. S. Tenney, Williamstown, Mass.
G. W. Tryon, Philadelphia, Pa.
Prof. A. E. Verrill, New Haven, Conn.
R. H. Ward, M.D., Troy, N. Y.
Prof. A. Winchell, Ann Arbor, Mich.
Walter Woodman.
Dr. William Wood, East Windsor Hill, Conn.
Charles Wright, Cambridge, Mass.
Prof. J. Wyman, Cambridge, Mass

COPIED FROM

Nature, London.
Scientific Opinion, London.
Monthly Microscopical Journal, London.
Proceedings of the Entomological Society of London.
Quarterly Journal of Science, London.
Popular Science Review, London.
The Academy, London.
Annals and Magazine of Natural History, London.
Cosmos, Paris.
Bibliotheque Universelle, Archives des Sciences Physiques et Naturelles, Geneva.
Siebold and Kölliker's Zeitschrift fur Wissenschaftliche Zoologie, Berlin.
Sitzungs-berichte der Naturwissenschaftliche Gesselschaft "Isis," Dresden.
American Journal of Science, New Haven, Conn.
Franklin Journal, Philadelphia.
Annals of the Lyceum of Natural History of New York.

THE

AMERICAN NATURALIST.

Vol. IV.—MARCH, 1870.—No. 1.

THE PRIMEVAL MONUMENTS OF PERU COMPARED WITH THOSE IN OTHER PARTS OF THE WORLD.

BY E. G. SQUIER, M.A.*

THERE is a class of stone structures in Peru belonging to what is regarded through the world as the earliest monumental period, coincident in style and character with the cromlechs, dolmens, and "Sun" or "Druidical" circles, so called, of Scandinavia, the British Islands, France, and Northern and Central Asia. The existence of such remains in Peru has not, I believe, been hitherto mentioned by any traveller in that country. They are not very numerous, at least not in the parts of Peru traversed by me, but their scarcity is probably in great part due to circumstances and causes to which I shall refer further on, and is by no means inconsistent with the supposition that they formerly existed in considerable, if not very great numbers.

I think students will attach importance to these remains as indicating the existence at one time or another in Peru of a population identical in degree and stage of development with the people who raised corresponding lithic and megalithic

* Fellow of the Society of Antiquaries of London; Honorary Fellow of the Anthropological Societies of London and Paris; Fellow of the Royal Society of Antiquaries of Copenhagen, etc., etc.

monuments in other parts of the world, and who, if not the progenitors of the semi-civilized nations found in Peru at the time of the conquest, certainly preceded them in the occupation of the country. If it should be found, nevertheless, that there has been a gradual development of any of these rude remains into elaborate and imposing monuments, corresponding with them in their purpose or design, or a gradual change from the rough burial chamber of uncut stones into the symmetrical sepulchral tower built of hewn blocks accurately fitted together, and in general workmanship coinciding with the other and most advanced and admirable structures of the country, then we may reasonably infer that the latter were constructed by the same people that built the first, and that, monumentally, at least, the civilization of Peru was indigenous, gradually developed and not intruded. Leaving, however, the very few and obvious deductions I may feel justified in making, for the close of this brief paper, I wish to call attention to three groups of monuments, the *chulpas* and other remains of Acora, Quellenata, and Sillustani, all in the great terrestrial basin of Lake Titicaca, near that lake, in that political subdivision of the ancient Peruvian Empire called the *Collao*, and now Department of Puno.

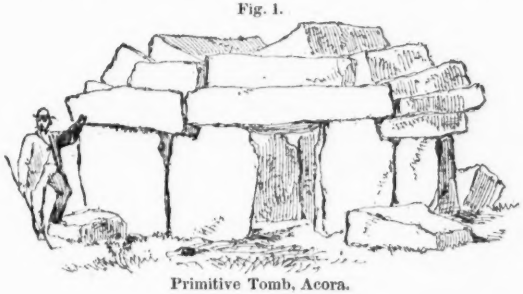
The arable portions of Peru, circumscribed by mountains, cold and sterile *punos* or table-lands, and bare deserts, early forced the population of the country to a close economy of their cultivable lands, and led them to bury their dead and build their towns in waste places, on arid hillsides above the reach of irrigation, or on rocky eminences and promontories, which even their patient industry could not make productive. In such positions throughout the ancient Collao, we find numberless cemeteries, often in proximity to the ruins of towns and villages. Some of these cemeteries are marked by really imposing monuments, and form conspicuous features in the landscape.

The first and simplest form of the burial monument, and which I shall assume, for the present, to be the oldest, con-

sists of flat, unhewn stones of varying lengths set firmly in the ground, projecting above it from one to two feet, so as to form a circle, more or less regular, about three feet in diameter. The body was buried within this circle, in a sitting or crouching posture, and with a vase of pottery or some other utensil or implement at its feet. Sometimes a few flat stones were laid across the upright ones, so as to form a kind of roof, and in a few instances these rude tombs were placed side by side in long rows, and stones afterwards heaped over them, so as to give them the appearance of lines of ruined walls.

Another rude but more advanced and impressive form of

Fig. 1.



Primitive Tomb, Acora.

the tomb consists of large slabs of stone, projecting from four to six feet above the ground, and also set in the form of a circle or square of from six to sixteen feet in diameter. These uprights support blocks of stone, which lap over each other inwardly, until they touch and brace against each other, thus forming a kind of rude arch. A doorway or opening is often found leading into the vault, formed by omitting one of the upright stones.

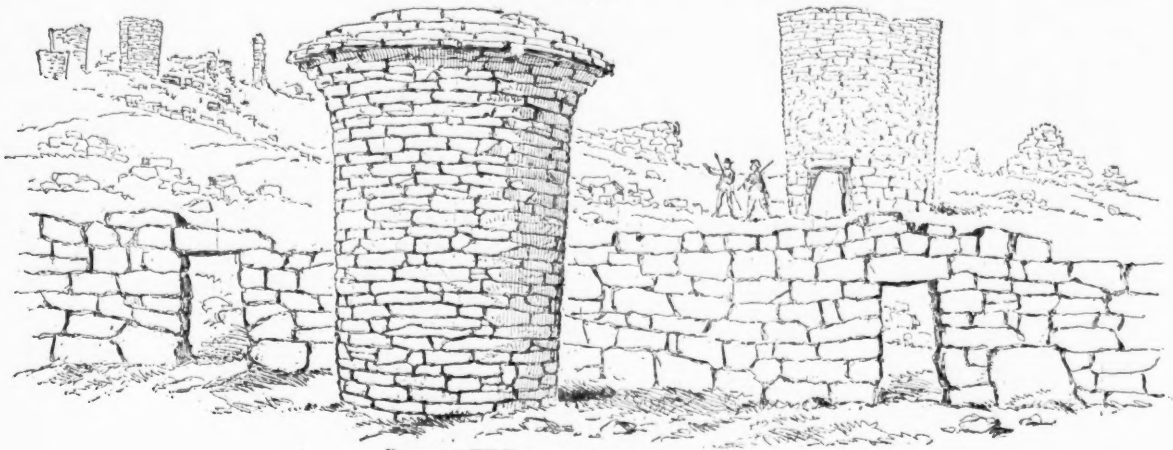
The arid plain to the south of the town of Acora, near the shores of Lake Titicaca, and twelve miles distant from the ancient town of Chucuito, is covered with remains of this kind, of which Fig. 1 is an example; and on the western border of the plain, at the base of the mountains which

bound it in that direction, are some of the better class of *chulpas*, round and square, built of worked stones, to which I shall have occasion to allude in another place.

A modification of the second class of *chulpas*, which I have described, or rather an improvement on them, is to be found among the ruins, so called, of Quellenata to the northeast of Lake Titicaca, in Bolivia (Fig. 2), and at many other places in the ancient Collao. Here the inner chamber or vault is formed, as in the case of those already noticed, by a circle of upright stones, across the tops of which flat stones are laid, forming a chamber, which often has its floor below the general level of the earth. Around this chamber a wall is built, which is carried up to varying heights of from ten to thirty feet. The exterior stones are usually broken to conform to the outer curve of the tower, and the whole is more or less cemented together with a very tenacious clay. Nearly all are built with flaring or diverging walls; that is to say, they are narrower at their bases than at their tops. Sometimes this divergence is on a curved instead of a right line, and gives to the monument a graceful shape. In Quellenata I found only one skeleton in each of the *chulpas* I examined; and none of the *chulpas* had open entrances. Similar structures in shape and construction occur in great numbers among what are called the ruins of Ullulloma (Fig. 3), three leagues from the town of Sta. Rosa in the valley of the river Pucura. But here the *chulpas* have openings into which a man may creep, and all of them contained originally two or more skeletons.

Returning now to Acora. As I have intimated, within sight of the rude burial monuments already noticed as existing there,—and which so closely resemble the *cromlechs* of Europe,—are other sepulchral monuments, showing a great advance on those of Quellenata and Ullulloma. They are both round and square, standing on platforms of stones regularly and artificially shaped, and are themselves built of squared blocks of limestone. In common with the primitive

Fig. 2.



Pucura, or Hill Fortress of Quellenata, with Chulpas.

and typical forms of the same class of monuments already described, these also have an inner chamber, vaulted by overlapping stones, after the fashion of the earlier approximations towards the arch. They differ, however, in having each four niches in the chamber or vault, placed at right angles in respect to each other. The sides of these niches converge a little towards their tops, as do most of the Inca niches, windows and doorways. In these niches were fastened the bodies of the dead, in squatting or crouching postures.

Fig. 3.

Chulpa, Ullulloma, partly ruined.

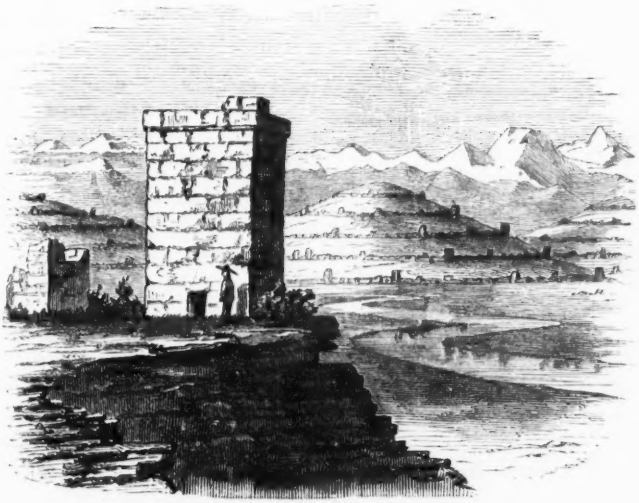
Figure 4 is a view of a double-storied, square *chulpa*, with a *pucura* or hill fort in the distance, occurring near the Bolivian town of Escoma, on the eastern shore of Lake Titicaca. Figure 5 is a section of this *chulpa*. I introduce these cuts to show some of the variations in this class of monuments. Escoma is on the same side of Lake Titicaca with Quellenata, but sixty miles to the southward; and it is a curious fact, that while at the latter place all the *chulpas* are round, at the former they are all square.

The sides of all the square *chulpas* appear to be perfectly vertical, and near their summits we find a projecting band or

cornice. Their tops seem to have been flat. On the other hand the round *chulpas* here swell out regularly up to the ornamental band or cornice, and terminate in a dome.

These features, however, are still better marked in the ruins of Sillustani, where the *chulpas*, in respect of size, elaboration of design and workmanship, take their highest form. Here we find them built of great blocks of trachyte and other hard stones, fitted together with unsurpassable

Fig 4.



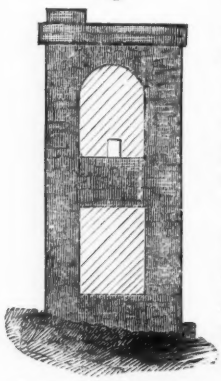
Square Chulpa, Escoma, Bolivia.

accuracy, the structure nevertheless preserving some of the characteristic features of the first and rudest form of the *chulpa* (Fig. 6). The lower course of stones is almost invariably composed of great blocks of which the unhewn portions are set in the ground, and these support a series of layers, not always regular in respect of thickness, nor uniform in respect of size, but which have their sides cut on exact *radii* of the circle, and their faces cut with an accurate bevel upward to correspond with the swell of the tower.

The stones forming the dome are not only cut on accurate radii, but the curve of the dome is preserved in each, and they are furthermore so cut that their *push* or plunge is inward towards the centre of the structure, thereby tending to give it compactness and consequent strength. There are many other interesting architectural features connected with these remains of Sillustani, the enumeration of which is not necessary in order to illustrate the particular question before us.*

Some of the *chulpas* of Sillustani have double vaults or chambers, one above the other, and others have a double row of niches, in a single chamber, with a cist, carefully walled up, sunk in the earth below. There are a few built of rough stones plastered and stuccoed over, and painted, with inner chambers also stuccoed.

Fig. 5.



Section of Chulpa (fig. 4).

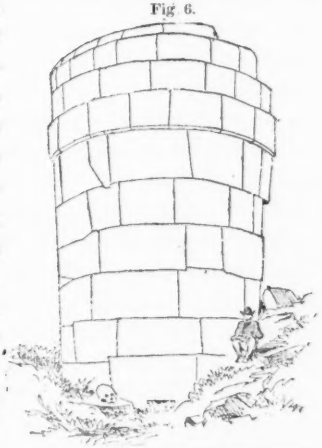
Now, in all these varieties of the burial monument called the *chulpa*, from the rude pile of rough stones at Acora, so much resembling the European *cromlech*, through every variety of form and phase of skill to the fine towers of Sillustani we discover common features, a common design, and many evidences that all were equally the work of the same people. If so, do the ruder monuments mark an earlier and possibly very remote period in the history of that people? And do the various stages of development which we observe in this class of monuments, correspond with like stages in the development of their builders? Or did they build the rough tomb

* For purposes of comparison, I introduce a reduction from a photograph, of a view of a so called Pelasgic round tower, among the ruins of Alatri, Italy (Fig. 7). The resemblance between the style and workmanship of the Sillustani monuments and those of Alatri is strong, except that the stones of the former are much the largest, and are cut and fitted with much greater accuracy. In no part of the world have I seen the art of stone-cutting and fitting carried to the point of perfection it was by the ancients of Peru.

for the poor and insignificant, and the grander and more elaborate monument for the rich and the powerful, as we do today?

I incline, for reasons not altogether drawn from an investigation of this single class of monuments, to the opinion that the various forms of the *chulpa* are indices of different eras. I doubt if monuments were ever raised, whether rude or imposing, except over important persons. I believe that anciently as now, the common Indian, the patient servant of the chief or *curaca* of old, as of the *gobernador* of our age, received few burial honors. His grave was unmarked by stone or symbol. The *chulpas* probably signalize the graves of individuals distinguished in their periods, upon which contemporaneous skill and effort were expended. If the monument was rude, it was because the people who raised it were also rude. At the time it was erected the *cromlech* or *chulpa* of Acora cost, it may be, an effort as great or greater than was exhausted, at a later period, on the elaborate and imposing towers of Sillustani. And, altogether, I am convinced, speaking for the present only in view of sepulchral monuments, that their development in Peru may be traced from their first and rudest form up to that which prevailed at the time of the Conquest, preserving throughout the same essential features.

Fig 6.



Chulpa, or Burial Tower, Sillustani.

But it is not in the early sepulchral monuments of Peru, that we have absolute coincidences with the remains which are now accepted as among the primitive monuments of mankind. As we find in both Europe and Asia the rude

monuments of religion existing side by side with those of sepulture, so we find in Peru the Sun-circle, or primitive, open, symbolical temple, side by side with the Peruvian *chulpa*. In many places we discover circles defined by rude upright stones, and surrounding one or more larger upright stones placed sometimes in the centre of the circle, but oftener at one-third of the diameter of the circle apart, and on a line at right angles to another line that might be drawn through the centre of the gateway or entrance on the east.

In connection with the group of *chulpas* at Sillustani, or rather on the same promontory on which these occur, are found a number of such Sun-circles, which seem strangely to have escaped the notice of travellers. The tradition of their original purpose is preserved in the Quichua name they still bear of *Intihuatana*, "where the sun is tied up."*

Some of these circles are more elaborate than others, as shown in the engraving (Fig. 8), from which it will be seen that while the one nearest the spectator is constructed of simple upright stones, set in the ground; the second one is surrounded by a platform of stones more or less hewn and fitted together. The first circle is about ninety feet in diameter; the second about one hundred and fifty feet, and has a single erect stone standing in the relative position I have already indicated. A remarkable feature in the larger circle is a groove cut in the platform around it, deep enough to receive a ship's cable.

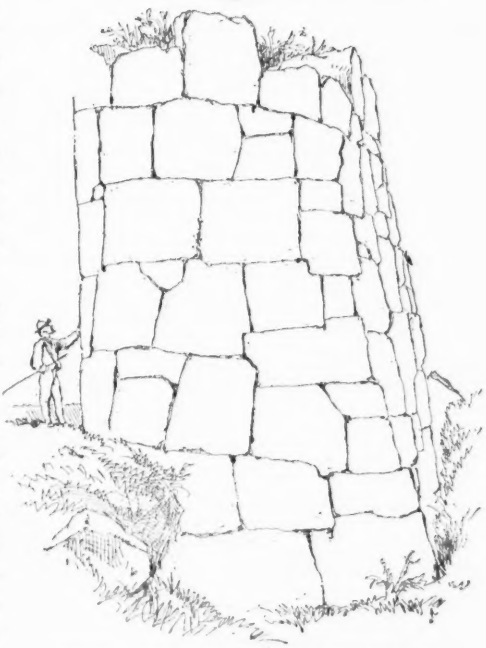
I am well aware that many of the smaller so called Sun-circles of the old world are rather grave-circles, or places of sepulture; but that in no way bears on the point I am at present illustrating, namely: the close resemblance if not absolute identity of the primitive monuments of the great Andean plateau, elevated thirteen thousand feet above the

* *Inti*, in the Quichua language, signifies the Sun, and *huatana*, the place where or the thing with which anything is tied up. The compound word is still applied by the Indians to dials and church clocks. *Huata* signifies a year.

sea, and fenced in with high mountains and frigid deserts, with those of the other continent.*

Peru has many examples of that kind of stone structures called Cyclopean, in which stones of all shapes and sizes are fitted accurately together, without cement, so as to form a solid whole. The great Inca fortress of the Sacsahuaman, dominating the city of Cuzco, the old Inca capital, is one of the most imposing monuments of this kind in America or the world, and claims to rank with the pyramids themselves as an illustration of human power.

Fig. 7.



"Pelasgic" tower, Alatri, Italy. (See foot note p. 8.)

But apart from remains of this kind, which characterize comparatively late eras, we find remains of similar design, often imposing, but rude, and on the stones of which we look in vain for the traces of tools of any kind. In con-

*Cromlechs and Megalithic monuments appear to have been under discussion in the Ethnological Society of London during the past year (1869). Mr. Hodder M. Westropp, while indicating their wide range from Etruria to Malabar, from the steppes of Tartary, to the centre of Arabia, and from Scandinavia to the Pacific Islands, insisted on their purely sepulchral character, and regarded them, even when taking the form of great circles, simply as tombs, indicative of a very early and low phase of civilization. He seems to have supported his views (of which I have only an abstract in

struction they somewhat resemble the works uncritically known as *Pelasgic*. A notable example may be named in the ruins of Quellenata, already mentioned, situated on a mountain dominating the town of Vilcachico, and overlooking Lake Titicaca (Fig. 2). Still another, but less rude, is the great fortress of Chancayillo or Calaveras, in the upper part of the valley of Casma.

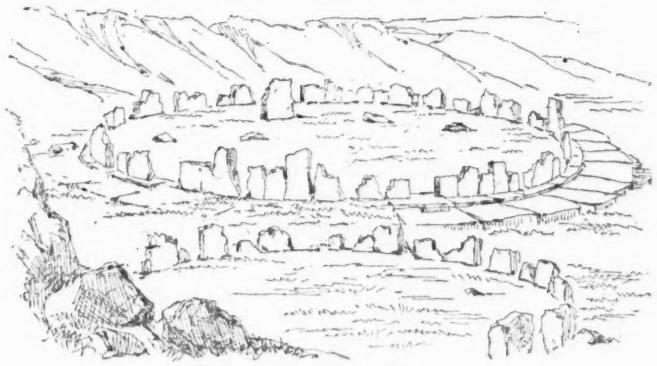
Tradition affirms that these *pucaras*, or strongholds, were reared long ago, when the inhabitants of Peru were divided up into savage and warlike tribes, "before the sun shone," or the Incas had established their benignant rule. They are held in a certain veneration as the works of giants, whose spirits still haunt them, and require to be propitiated with offerings of *chicha* and *coca*. Hundreds of these remains, often of great extent, crown the bare mountain tops of Central and Southern Peru and Bolivia, and are scattered all through the grand Andean plateau. Looking upon them in their obvious character, expressed also in their name of *pucaras*, as strongholds or fortresses, we find them to be but rude types of the extensive and elaborate defensive works constructed by the Incas, and in which were introduced parapets, salient and reëntering angles, and many of the

---

French) by the circumstance that human bones, and other evidences of sepulture, are found in all or nearly all of these monuments. But we know that the temple and the tomb have gone together from time immemorial, lending to each other reciprocal sanctity and reverence. Will the antiquaries of the future quarrel over the question whether Westminster Abbey and the Church of St. Denis were tombs or temples, one or both? In this discussion Mr. Lane Fox (and I am still confined to the abstract alluded to), after indicating a still wider area for megalithic monuments than Mr. Westropp, including the Canary Islands, Algeria, Palestine, Persia, the Fejee Islands and the Ladrones, leans to the hypothesis that they were the work of one people that spread east and west, between barriers of seas like the Mediterranean on the south and eternal snows on the north, and that civilization was developed on the line of their occurrence. And that, the vast regions in which they are not found (in which America is enumerated), "are precisely those where civilization never penetrated." Civilization is, of course, a relative term, and one to which nations who in this age go to war with one another may doubtfully aspire, but to which the beneficent Incas, to say nothing of the Arcadian inhabitants of New Mexico might lay good claim. Still, if megalithic monuments of any kind are evidences of civilization, or even of its first stages, Peru, from what has been inserted in the text, can no longer "be left out in the cold;" and if civilization took the route of these monuments it certainly spread "laterally" past the Pacific Islands to America, or—*vice versa*.

most important features of modern fortifications. In short, as we find in the rude *chulpas* of Acora, the essential features of the imposing and skilfully constructed burial towers of Sillustani, so we find in these primitive defenses the fundamental ideas subsequently elaborated in the gigantic fortresses of Sacsahuaman, Pisac, and Ollantaytambo. Some instances fell under my notice in Peru, of single rough upright stones, occasionally of great size, which were *huaca* or sacred, and to which great reverence is still paid by the Indians. A notable instance is to be observed on the sum-

Fig. 8.



Intihuatanus of Sillustani, Peru.

mit of a high, bare hill, on the road between the port of Simanco and the town of Nepeña, and which overlooks the interesting ruins of Huaca-Tambo. No doubt some of these stones were set up by hand of man, but most of them occupy natural positions.*

The celebrated ruins of Tiahuanaco in Bolivia, which may be called the Stonehenge or Carnac of the new world, afford a striking example of the artificial arrangement of rough as well as upright stones, in the form of squares and rectangles,

*The Indians of the coast of Peru raised large stones in their *chacras*, gardens and cultivated fields, which they called *chichoe* or *Truanca*, also *chacrayoc*, or Lord of the *chacra*. This stone received especial reverence at seed time.

and on parallel lines. Here we find quadrangles defined by huge, unhewn stones, worn and frayed by time, and having every evidence of highest antiquity, by the side of other squares of similar plan, but defined by massive stones cut with much elaboration, as if they were the work of later generations, better acquainted with the use of tools fit for cutting stones, who nevertheless retained the notions of their ancestors, bringing only greater skill to the construction of their monuments. The megalithic remains of Tiahuanaco rank second in interest to none in the world.

Fig. 9 is of a singular monument, in the ancient town of Chicuito, once the most important in the Collao. It is in the form of a rectangle, sixty-five feet on each side, and consists of a series of large, roughly worked blocks of stone, placed closely side by side on a platform, or rather on a foundation of stones, sunk in the ground, and projecting fourteen inches outward all around. The entrance is from the east, between two blocks of stones, higher than the rest. This may be taken as a type of an advanced class of megalithic monuments by no means uncommon in the highlands of Peru. The features I seek to illustrate would be made more apparent by a greater number of views, plans, and sections than I am now able to present, as may be inferred from the few accompanying this paper. When they shall come to be fully illustrated, I think all students will coincide with me in my already matured opinion that there exist in Peru and Bolivia, high up among the snowy Andes, the oldest forms of monuments, sepulchral and otherwise, known to mankind, exact counterparts in character of those of the "old world," having a common design, illustrating similar conceptions, and all of them the work of the same peoples found in occupation of the country at the time of the Conquest, and whose later monuments are mainly if not wholly the developed forms of those raised by their ancestors, and which seem to have been the spontaneous productions of the primitive man in all parts of the world, and not necessarily nor even probably derivative.

Fig. 9.

Ancient Monument, Chicuito.

I have only to add one word in respect to caverns. There are many of these in the *sierras* of Peru, in which the modern traveller is often glad to find refuge, as was the Indian voyager before him. But few of these however, seem to have been inhabited. Generally they appear to have been used as burial places, and abound in desiccated human bodies, human bones, objects of human art, and the bones of indigenous animals, often cemented together with calcareous deposits. Some of the many Peruvian traditions affirm that the ancient inhabitants of the country emerged from the limestone caverns in the frontier Amazonian valley of Paucartambo.* The best accepted perhaps of the Peruvian traditions assigns to the Sun-born Manco Capac, his birth-place and early residence in a shallow cavern on the island of Titicaca, out of which the sun rose to illuminate the earth, and which was regarded as the most sacred spot in the Inca Empire. That man should first seek shelter in caverns, in a cold and arid region like the *plateau* of Peru, where wood is scarce or unknown, is equally natural and probable; but the evidences of such a practice do not exist, or rather have not yet been discovered.

That considerable aboriginal Peruvian tribes once lived in houses built on piles, or on floats, in the shallow waters of the Andean lakes, is not only probable but certain. The remnants of such a tribe, bearing the name of Antis, still live in this manner in the reedy lakes formed by the spreading out or overflow of the Rio Desaguadero, the outlet of Lake Titicaca. These people spoke and still speak a lan-

*The old Jesuit, Arriaga, in his rare and valuable work *Extirpacion de la Idolatria del Peru* (1621), tells us not only that the inhabitants of the coast of Peru reverenced the *Huaris*, "who were their ancestors and also giants, but the buildings erected by them." He adds: "They reverence also their *Pacarinas*, or places of ancient residence, to the degree of preferring to live in them, notwithstanding that they are built in lofty, rocky, arid places, often a league from water, and only possibly to be reached, and even then with difficulty, on foot."

The word *Pacarina*, as given by Arriaga, is embodied in that of Paucartambo, the name of one of the upper Amazonian Valleys, running parallel to that of Yucay, near Cuzco, whence, one of the traditions of the Incas derives the founders of their civilization and empire. The name is only a corruption of *Pacari*, to be born; and *tampu*, a dwelling or stopping place — the whole being equivalent to birth-place or homestead.

guage differing equally from the Aymara and Quichua, called Puquina, and the early chroniclers speak of them as extremely savage, so much so that when asked who they were, they answered, they were not men but *Uros*, as if they did not belong to the human family. Whole towns of them, it is said, lived on floats of *totora* or reeds, which they moved from place to place according to their convenience or necessities.

REMARKS ON SOME CURIOUS SPONGES.

BY PROFESSOR JOSEPH LEIDY.

Among the many remarkable marine productions which puzzle the naturalist as to their relationship in the animal kingdom, is the *Hyalonema mirabilis* of the Japan seas. First described and named by Dr. John E. Gray, of the British Museum, this distinguished zoologist viewed it as a coral related with Gorgonia, or the Sea Fan.

The specimens of Hyalonema, as ordinarily preserved, appear as a loosely twisted bundle of threads converging to a point at one extremity of the fascicle and more or less divergent at the other. The threads bear so much resemblance to spun glass that the production has received the name of the Glass Plant. They are mainly composed of silex and are translucent, shining, and highly flexible. The fascicle is upwards of a foot and a half in length and near half an inch thick. The threads range from the thickness of an ordinary bristle to that of a stout darning needle.

Specimens of the Hyalonema fascicle, as they have been brought to us, almost invariably present some portion invested with a brown warty crust; the wart-like elevations terminating in a cylindrical ring with radiating ridges. These elevations are the individual polyps, continuous through the

intervening crust, of which Dr. Gray views the fascicle as the central axis.

In some specimens of the Hyalonema fascicle the narrow end is enveloped in a spongy mass, or as Dr. Gray observes, "a species of sponge." He supposes the sponge to be independent of the fascicle or "coral," though necessary to it as a means of attachment in its habitation. According to this view the fascicle with its warty crust, is a parasite of the sponge into which the fascicle is inserted. Dr. Gray remarks that "in general the specimens are withdrawn from the spongy base and the lower part of the axis is cleaned; but it is evident that they all are attached to such a sponge in their natural state."

When the writer first had an opportunity of seeing a specimen of Hyalonema, consisting of a fascicle partially invested with a warty crust, presented to the Academy of Natural Sciences of Philadelphia in 1860, and before he had seen an account of the remarkable production, his impression was that it was a silicious fascicle of a sponge, upon which a parasitic polyp had found a convenient and secure resting-place. M. Valenciennes had previously expressed a similar opinion, as observed in the introduction to Professor Milne Edwards' work on British Fossil Corals.

Notwithstanding the frequency of silicious threads entering into the composition of many sponges, Dr. Gray remarks, in referring the Hyalonema fascicle to a coral, that this is peculiar "as being the only body the animal nature of which is undoubted that is yet known to secrete silica; the spicules and axis of all the corals which had fallen under his observation being purely calcareous."

Professor Brandt of St. Petersburg views the fascicle and its warty crust as parts of a polyp, and the sponge mass as a parasite which attaches itself to the polyp, gradually penetrating its silicious axis, and finally killing it.

Dr. Bowerbank who has so extensively investigated the sponges in general, regards all three of the elements of the

Hyalonema—the fascicle, the warty investment and the sponge mass—as parts of one sponge. The wart-like elevations of the crust he views as oscules of the sponge.

Professor Max Schultze of Bonn, has published an elaborate memoir on the Hyalonema, accompanied by beautiful plates of perfect specimens preserved in the Museum at Leyden. He represents the fascicle and the sponge mass attached to one end as belonging together, while the warty crust is referred to a polyp, to which the author has given the name of *Polythoa fatua*.

To conclude these discordant views, we may add that of the distinguished micrologist Ehrenberg, who considers the fascicle as an "artificial product of Japanese industry."

The Hyalonema in Professor Schultze's work, is represented as a sponge mass of conical or cylindrical form with rounded summit, from which the rope of silicious threads projects. The sponge mass measures five inches long and three in diameter; the fascicle projects a foot and two inches. The sponge mass is described as composed of loosely interwoven cords of fine silicious needles. The entire surface, except the end opposite to the fascicle, is provided with numerous orifices about one line in diameter. The flattened end of this sponge mass is furnished with six orifices half an inch in diameter, communicating by canals in the interior with a system of interspaces finally ending in the smaller orifices of the surface generally.

The long silicious threads of the fascicle are composed of delicate concentric layers enclosing a fine central canal. The external layer appears to be composed of imbricating rings, most conspicuous toward the free end of the thread and almost or quite disappearing toward the other end. The arrangement reminds one of the appearance of the cuticle on the hairs of mammals. The projecting edges of the ring toward the free ends of the thread are most prominent and also form reversed hooklets.

Professor Schultze regards the sponge mass as situated at

the bottom of the fascicle, and its flattened extremity with the large oscules at the base. This appears to be the general view, but it has occurred to me that the sponge mass in its natural position was uppermost, and was moored by its glassy cable, or rope of sand, to the sea bottom, perhaps to marine algæ. This opinion is founded on the circumstance that in sponges generally the large oscules from which flow the currents of effete water are uppermost. The ends of the threads of the fascicle, with their reversed hooklets, are also well adapted to adhere to objects.

The equally wonderful and still more beautiful *Euplectella* of the Philippines was also at first represented upside down, as seen in the figure of Professor Owen in the "Zoological Transactions of London," the reverse of the position now assigned to it as represented in figure 76 of the third volume of the NATURALIST. In the same manner Euplectella and Hyalonema appear to me to be alike constructed so as to be anchored in position by the silicious threads, with their reversed hooklets. It may be that Hyalonema, in its home, is suspended by means of its glossy cable, but I think it highly improbable that it should either sit or be attached by the base of the sponge mass in which the large oscules are placed.

In the Proceedings of the Zoological Society of London for 1867, Dr. Gray observes that, according to Dr. William Lockart, "the Japanese Hyalonema is found growing on the rocks of the island of Enosima not far from Yokohama. The fishermen offer the sponges with their silicious fibres for sale to visitors at the temples of Enosima."

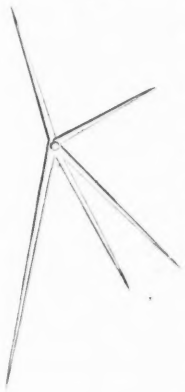
An entirely different sponge, apparently intermediate in character with Hyalonema and Euplectella, recently described in the Proceedings of the Academy of Natural Sciences of Philadelphia, under the name of *Pheronema*, would appear to throw some light upon the question of what belongs to Hyalonema. The specimen, obtained from the island of Santa Cruz, W. I., is preserved in the Museum of

the Academy. It is represented in the accompanying figure (Fig. 10), one-half the natural size. The body of the sponge is oblong ovoidal, with one side more protuberant than the other. The narrower extremity, which I suppose to be the upper, is conical, and its truncated apex presents a single, circular orifice, the third of an inch in diameter. The opposite extremity is rather cylindrical with a broad, slightly rounded extremity, from which project numerous fascicles of silicious threads.

Fig. 10.

The sponge body is of a light brown hue, and rigid to the feel. Its surface exhibits an intricate interlacement of the sponge tissue, which appears mainly composed of stellate, silicious spicules of various sizes. The coarser spicules of the surface, of which one is represented in Fig. 11, three times the diameter of nature, have five rays. Four of these together are irregularly cruciform, while the fifth projects in a direction opposed to all the others. They appear to be so arranged that the crucial rays interlace with those of the contiguous spicules, forming a lattice work on the surface of the sponge, while the odd ray opposed to the others penetrates the interior of the sponge. The finer tissue, seen through the intervals of the latticed arrangement on the surface of the sponge, appears to be made up in the same manner of finer stellate spicules. Some of the largest stellate spicules of the surface have a spread of half an inch.

Fig. 11.



The fascicles of silicious threads projecting from the body

of the sponge are upwards of twenty in number and over two inches in length. They resemble in appearance tufts of blonde human hair. The individual threads are nearly like those proceeding from the lower end of Euplectella. Where thickest they are less than the $\frac{1}{200}$ of an inch in diameter, and become attenuated towards the extremities. At first, as they proceed from the body of the sponge, they are smooth and then finely tuberculate. The tubercles are gradually replaced by minute recurved hooks, which become better developed approaching the free end of the threads which finally terminate in a pair of longer opposed hooks, reminding one of the arms of an anchor, as seen in Fig. 12. The object of the tufts of threads, with their lateral hooklets and terminal anchors, would appear to be to maintain or moor the sponge in position in its ocean home.

Fig. 12.

The singular sponge thus described, the author has attributed to a genus distinct from Hyalonema and Euplectella, and has dedicated the species in honor of his wife, under the name of *Pheronema Annæ*.

Of the specimens of Hyalonema in the Museum of the Academy of Natural Sciences of Philadelphia, there is one which appears to the writer as somewhat significant. The fascicle would appear to have been withdrawn from its sponge body and lain sometime in the sea before it was found. This is inferred from the fact that the Polythoa crust reaches to within an inch and a half of the end, which in the natural condition is inserted in the sponge mass. Two sharks eggs are also attached to the fascicle by their tendrilled extremities, and one of the tendrils clasping the fascicle is included in the polyp crust.

THE FRESH-WATER AQUARIUM.

BY CHARLES B. BRIGHAM.

[Concluded from page 490, of Vol. iii.]

A VERY valuable addition to the specimens of an aquarium may be found in what are called the cray-fishes or fresh-water lobsters. These little animals so closely resembling their salt-water relations can be kept without much trouble in the general collection. They are natives of most parts of the country, though rare or limited in their habitat in New England. In New York they are abundant in the gravelly brooks and streams, especially in those near Trenton Falls. A careful observer will, as wading into the water he searches for them, see two claws just visible in a hole in the sand or under the edge of a rock; and if he can hedge the hiding place around with his net, and also possibly his straw hat, and then give the desired specimen a slight stimulus with his hand, he will find of a sudden his cray-fish resting quietly in the trap he has set. So quick are their motions that one has to keep a sharp lookout for them or they will escape; the average length of those found near Trenton Falls is about two inches. They are quite hardy, with this exception that they cannot bear water which is much above the normal temperature. In the summer time if the tank is so placed that the sun shines upon it too forcibly, or for too long a time, we shall probably find the cray-fish resting motionless upon the gravel with its claws and tail extended and its body somewhat swollen. If this state of things has not existed too long a time, immediate removal to cold water may revive the unfortunate victim by degrees. Some day, after the cray-fish has been a quiet inmate of the aquarium for some time, we shall be astonished in finding apparently two cray-fishes instead of one. Closer examination will disclose the fact that one of them is merely the cast-off shell of the

other; and now the newly clad cray-fish appears in a coat of a pinker hue than before, and tries to keep under the plants and conceal itself, until accustomed to its new garment it can venture forth once more into its little world. Cray-fishes eat small pieces of raw beef eagerly. We shall have to be careful that they do not crawl out of the tank, for if even a tassel of a curtain is left so near the water that it can be reached, we shall find our much prized specimen some morning dried up and lifeless in a corner of the room upon the floor.

Frogs are interesting objects of study, and to many are great favorites; they are best kept in a tank with an inch or two of water, with a number of islands or resting-places above the water for them. A wire screen over the top of the tank will be necessary to keep the specimens together.

Two of the most useful and instructive sets of specimens which the aquarium contains are its snails and mussels; useful, because they act as the scavengers of the tank, and from what would otherwise be the refuse matter make their living from day to day; instructive, because they serve to illustrate in a small way the great principle by which the health and purity of all our larger ponds and lakes is maintained. The snails live upon the bits of decayed plants and the confervoid growths in the tank, and the mussels by filtering the water act as constant purifiers. There are three kinds of snails common in our ponds and streams, the *Planorbis trivolvis* the *Paludina decisa*, and the *Lymnæa desidiosa*. Of these the best is the Planorbis, a snail with a shell coiled like a modern chignon; it is hardy and of clean habits, and does almost as much work as its neighbor, the Paludina; it is found chiefly in ponds or large streams, while the Paludina can be obtained in great numbers in small brooks or pond holes. The Lymnæa is found near the gravelly beaches of the larger ponds; it is a beautiful snail, but does not confine itself to the refuse matter, and is apt to eat eagerly the most delicate plants in the tank; it is, therefore, generally an

unwelcome visitor. Of the mussels, those found in ponds with their many rayed shells, and those river mussels with their thick, unattractive coverings, are alike useful; they move from one side of the tank to the other with ease, and we must not expect to find them always in one position; the number of snails which may be kept to advantage in a tank is very large; they are so apt to perish during the winter that it will be well to begin the season with as large a stock as two hundred for a medium sized tank; a dozen mussels of a size proportioned to the tank will be sufficient.

There are many specimens, such as fishes at the time of spawning, or those particularly fierce, or certain larvæ, which would either be destroyed or seen to disadvantage in the general collection. For each of these a separate tank is indispensable; some glass jars of strong clear material holding about two quarts, will answer every purpose, and the contents can be arranged precisely as if they were large aquaria. After one has had an aquarium in operation for some time extra tanks of this sort will be found very useful and necessary; for if a specimen gets injured or is in poor condition, a few weeks recruiting in a separate tank will often save its life; or, if we have a larger stock of plants than the large tank will accommodate at the time, when later in the winter the plants die off, then we shall wish to replace them from specimens in the reserve stock.

The instruments used for aquarial purposes are few in number and simple. We need a good net a foot or two in diameter, with very fine meshes, and a flat basket so partitioned off that it will hold four good sized jars; these jars may be of earthen-ware or of strong glass, the latter material being perhaps better, as we can then see how many specimens each jar contains without trouble. Most of the plants can be taken home (if the distance is not too great) rolled up in the net, while the mussels can occupy the room between the jars. It is very necessary to keep the plants moist, as they are much blighted if allowed to dry; if

covers for the jars are used at all they should be caps of mosquito netting held on by India-rubber rings.

For the tank a glass rod about a foot in length and a quarter of an inch in thickness will be of use in moving the specimens into place when disarranged. Too much cannot be said against unnecessarily meddling with the specimens in the aquarium; a slender rod with a sponge attached to the end of it will be useful in removing the confervæ from the sides of the tank; a small gauze-net three or four inches in diameter is often needed to remove dead or objectionable specimens; an India-rubber pipe several feet in length affords the simplest method of drawing off the water of the tank; a fine gauze should be placed over that end of the pipe which is in the tank, otherwise the specimens may pass through it and be lost.

Should the water in the tank become impure by any means it can often be purified by the following simple method: take a small earthen flower-pot holding about a pint, and insert a piece of sponge tightly in the opening at the base so that when the water is placed in it it will pass through the sponge only drop by drop; the pot being filled with one-third powdered charcoal and two-thirds water, place it over the tank and let it empty itself into the aquarium. The effect of this simple contrivance is astonishing and it will often save one the trouble of arranging the aquarium anew.

The time of feeding and the amount of food may depend somewhat upon the kind of stock in the aquarium. As a general rule it is better to keep the specimens under than over-fed, for they do not then by wasting their food make the water impure. Twice a week is often enough to feed them, and then very small pieces of raw beef will be found the best food; gold-fishes will not always eat the beef, and for them crumbs of bread are necessary; should we find that they do not eat all that is given we must stop the feeding at once and remove with the glass rod the neglected portion.

The process of accustoming certain salt-water fishes, such

as minnows and stickle-backs, to fresh water must be done gradually if we wish a happy result; in this process we have an example to follow, set by nature herself, for there are instances of bodies of what were once salt waters, so freshening by degrees that they still retain seals and certain marine animals. We may find crabs in the Charles River at some distance above Cambridge, and they may be kept alive and in health for a length of time in the fresh-water aquarium.

The system of artificial aëration and that of producing an ebb and flow in the marine aquarium have been practiced with success in large collections of aquaria.

The value of the aquarium as a means of instruction cannot be overestimated, affording as it does the opportunity of studying the habits of aquatic animals in a manner attainable by no other means, and giving to all an inducement to pursue further the study of natural history which will be a pleasure throughout life.

A SKETCH OF THE TRUCKEE AND HUMBOLDT VALLEYS.

BY W. W. BAILEY.

Since the opening of the Pacific Railroad all have had their attention more or less turned to that vast region lying between the Sierra Nevada and the Rocky Mountains. It is known as the Great Basin; but if, misled by the name, we conceive merely of a boundless valley, more or less desolate, we shall arrive at a somewhat erroneous conclusion. It is indeed a depression between the two giant ranges of the continent, but traversing this are successive parallel mountain chains with a north and south trend, and only inferior in altitude to the Rocky Mountains and the Sierra. Indeed, according to our eastern notions, the whole so-called basin is but a broad

mountain top, as no portion of it is below four thousand feet. Notwithstanding the general sterility of the soil it will be seen, as I proceed, that it sustains quite an extensive and peculiar flora. With the belief that a brief sketch of this unique region will be of interest to naturalists I have ventured to present the results of my observations.

My first botanical rambles were along the banks of the Truckee River, which has its source in Lake Tahoe, a lovely sheet of pure, cold and clear water, situated on the eastern boundary of California. From this Alpine lake the little river flows into the Great Basin and waters some of the best farming lands in Nevada. It is a narrow and rapid stream, mostly shallow, and with a rocky or sandy bottom. At intervals nature has adorned its banks with groves of cottonwood (*Populus monilifera*). It is sincerely to be hoped that these noble trees will be spared by the rapacious wood-choppers, as in a country so meagre in its sylva, a green thing, if it be but a shrub, is cheering to the spirit, and a full-sized tree is a positive delight. The size of these poplars, and the wide spread of their branches, render them especially welcome to the traveller, who, parched and weary, seeks refuge within their shade.

In speaking of the plants of Nevada it is convenient to classify them much as they are distributed in nature, and we find that according to their location they naturally fall into three grand divisions:

1st. The plants of the river bottoms and margins of irrigating canals.

2d. Those found on the desert plains at a distance from water.

3d. Those of the mountains.

These main divisions for ease in study may again be subdivided into sections almost as naturally marked, namely:

A marginal section immediately contiguous to the rivers or lakes.

A meadow tract, moistened generally by artificial irriga-

tion or by streams descending from the mountains, and usually dry in the summer months.

A desert section proper and one more particularly pertaining to the alkaline flats and vicinity of saline springs.

Lastly, the flora of the mountains is naturally divided into two distinct fields, according as the plants grow in the cañons in the vicinity of water, or flourish on the higher and more exposed regions where in the summer months little or no moisture is obtained, unless from an accidental shower, or by direct condensation from the atmosphere. Of course these divisions are more or less arbitrary and shade the one into the other. Following the above order we observe that on the Truckee there are a few plants immediately bordering the river and small streams which have apparently been drifted from above with soil and debris swept off by floods. The original habitat of some of these plants, I presume to be the neighborhood of Lake Tahoe, although no definite data can be given in support of such an opinion without an examination of the flora near the source of the stream. Still, certain plants which I always found on sandy shoals and islands in the Truckee, and nowhere else, lead me to this conclusion. Seeds, too, have undoubtedly been transferred from place to place through the same medium; but whether, with the exceptions just mentioned, the prevalent plants have advanced from the east or the west, I am not prepared to say. It would require for the study more time and larger experience than it was my lot to bestow upon it. The species of plants found along the Truckee at one camp differed but slightly from those discovered at another, preserving a close resemblance to each other as far as Wadsworth, the limit of my investigations. It would be tedious and uninteresting to read a list of the plants found in this region, a more correct account of which will, I hope, soon be given to the public by one more competent to treat of them, and I shall therefore only mention such as are conspicuous to the traveller as he passes by, or such as have a positive or

possible industrial value. Among the smaller plants a species of mint is common, and a hemp from which the Pi-Ute Indians make their bow strings. There is also a highly ornamental species of sunflower (*Helianthus*), well worthy of cultivation, as its smaller and more brilliant flowers render it more attractive than the grosser garden form. The Mexican Poppy (*Argemone Mexicana*), is occasionally seen, and a thistle, which I consider unequalled in beauty. The delicately cut leaves look as if formed of silver, and the flower resembles a paint-brush charged with scarlet lake. I have before mentioned the fine groves of cottonwoods, but in addition to these a fringe of willows is often found along the stream, and a mingled thicket of "Buffalo berry" (*Shepherdia argentea*), Roses (*Rosa blanda*), and other shrubbery. The bright berries of the Shepherdia and scarlet lips of the rose present a pleasing appearance, contrasted, as they are, with the silvery leaves of the former plant. When the roses are in bloom the effect must be even more charming.

Near Hunter's Station the river flows through extensive meadows producing abundance of hay and vegetables. The native grasses are mostly grown, but our own well-known "Timothy" (*Phleum pratense*), has been introduced to some extent, and is always much prized. This valley and that of the Carson form decidedly the richest portion of the state. The meadows are bounded by Washoe Peak, an outlying spur of the Sierra, by the Pea-vine mountains (so-called from the frequency with which the lupines or wild peas are met with on its sides), and a range lying to the east on which is situated Virginia City. That town, however, is not visible from the river. Washoe Peak is of very great height, and frequently shows snow upon its summit even in midsummer. It is a splendid mountain in form and color, and is especially admirable when the clouds which droop over its snowy sides, are suffused with California's own golden tints. After leaving this fertile valley, the Truckee enters a narrow gorge between high rocky hills, often beautiful in the colors

of their exposed strata and always in the graceful outline of their summits. Upon the higher portions only of these hills grows the juniper (*Juniperus occidentalis*), the chief and best firewood of this region, where fuel is so scarce that during the winter of my sojourn, wood sold as high as thirty dollars in gold in Virginia City. The cottonwoods are also sometimes used for fuel by those residing near the river, together with drift wood brought down from the Sierra. The lower slopes inclining to the stream support only the scraggy sage brush (*Artemisia*). Yet even in this narrow defile the farming lands are excellent, and are occupied and cultivated by thrifty settlers. The Truckee after flowing in a general easterly direction as far as Wadsworth, suddenly bends and following a north-west course empties into Pyramid Lake. This is a sheet of water about thirty-five miles in length and ten or twelve in width at the widest part. There are many small and steep rocky islands in the lake, some of them covered with an arborescent tufa resembling coral in its appearance. One very abrupt, pyramidal island gives its name to the lake which was discovered and partially explored by Fremont. The islands are the temporary home of pelicans and other sea fowl, who frequent them in the breeding season, and share the rocky soil with numerous rattlesnakes and lizards. Near the mouth of the river the land is good though subject to overflows, which while they fertilize the soil for future growth, often jeopardize the present crops. This land is held as a reservation by the Pi-Ute Indians, but even this remnant of their once broad acres is coveted by the neighboring whites. The lake is surrounded by mountains, and the lands removed from the water are of little or no value unless artificially irrigated.

Just before its *embouchure* the Truckee throws off a branch which supplies Winnemucka Lake, parallel to Pyramid, but separated from it by a narrow strip of highlands and mountain ridges. This lake is rarely found on any but the most recent maps and we are led to wonder how it could

have been overlooked. The fact that it is increasing in depth while Pyramid is said to be decreasing, seems to indicate that it is of recent origin and occasioned by some accidental deflection of the Truckee from its legitimate course. The fresh water of the river is soon deteriorated by admixture with that of the lake, which like all similar sheets, devoid of outlets, is brackish and unpleasant to the taste. The most showy plants of the Truckee Valley, in addition to those already mentioned, were a gigantic Thelypodium often rising to a height of six feet, two species of Mentzelia (*lævicaulis* and *albicaulis*) a species of Hosackia, and two of Cleome, and Sida. Near the mouth of the river occurs a remarkable deposit of infusorial earth. It is found encased in the calcareous tufa so prevalent in this vicinity. Under this lies the basaltic rock. The "chalk," as it is here called, is one hundred feet in width and forms a perpendicular bluff nearly forty feet in height from the stream, which at this point is very deep. The whole deposit is very free from impurities and upon microscopical examination, by my brother, proved to be composed entirely of fresh-water forms.

From the Truckee to the Humboldt Valley there is about a day's hard riding through deep sands and deserts devoid of water, where only grows a depauperate form of sage brush (*Artemisia*), or the equally dreary grease wood (*Obione*). The hills in sight are of volcanic origin, and are covered with loose and blackened scoriaceous rocks, occasionally encased in tufa. There is not a vestige of a tree, shrub or herb, with the exception of the ashy colored sage or the singular Effedra (*anti-syphilitica*). The first and only object that awakens any interest is the group of hot springs. There are some fifteen or twenty of these presenting different degrees of temperature. One spring indicated 201° Fah., while others were positively cool. The water is beautifully clear, but contains salts in solution which render it unpalatable. It is, when cooled, however, preferable to most of the villainous decoctions of the sixty-three elements,

which, in the absence of the genuine article, pass in this region for water. It is often in a state of violent ebullition, and is thrown up in intermittent jets, especially when extraneous substances are introduced. Some of the springs of this region, highly saturated with mineral ingredients, build for themselves a conical chimney, as it were, by the deposition of their dissolved constituents. Coarse and wiry, but verdant grasses spring up around. Sometimes living fish make their abode in these boiling springs, though not found in the particular group in question. I have seen them from similar wells where the surface of the water marked 70°. This statement is consistent with that of other observers in various parts of the world. Carpenter says "we have examples of the compatibility of even the heat of boiling water with the preservation of animal life. Thus in a hot spring at Manilla, which raises the thermometer to 187°, and in another in Barbary, whose usual temperature is 172°, fishes have been seen to flourish. Fishes have been thrown up in very hot water from the crater of a volcano, which from their lively condition, was apparently their natural residence." Various confervæ and animalculæ are known to occur in similar situations, and indeed, were noticed in these identical springs. Carpenter adds, "small caterpillars have been found in hot springs of the temperature of 205°, and small black beetles, which died when placed in cold water, in the hot sulphur baths of Albano." After these quotations I hope no one will charge me with Munchausenism. In apparent extravagance they certainly far surpass my statement.

A few hours after leaving the springs the road begins to descend, and soon a view is obtained of the basin into which both the Humboldt and Carson Rivers enter and "sink," or disappear in the sands. A broad, barren valley is stretched out before us, through which the course of the river is indicated by the fringe of green tules which border it. Occasionally the plain is marked by a tract of white alkaline

salts, looking like a snow field as it glistens in the sunlight. The mountains, most fantastic in outline, which border the valley, are enveloped in a gauze-like mist which seems to preclude all further inquiry into the features of the anomalous landscape. There is no live color in the scene. Even the greens with which nature usually relieves her more rugged details, are here wanting, except in the case of the tules above mentioned. Still there is a strangely fascinating and weird beauty in the view peculiar to these deserts. Here the Humboldt which begun its course far away as a fair young stream, expands into a lake, and becoming disgusted with its vitiated life commits suicide by self-burial. Hence the spot is known as the Sink of the Humboldt. At the sink proper, the water is intensely alkaline and disgusting to the taste, and the atmosphere is filled with noxious vapors and miasms. The legions of mosquitoes which infest the tules are the food of numerous water-fowl, to whom I candidly wish all success in their warfare upon the insects. Among the birds a black swan is said to appear at times, but I did not have the fortune to see one if any such occur. Above the lake the Humboldt is a narrow, sluggish and serpentine stream, hardly wider than an eastern creek and totally lacking its vivacity. The water is turbid and unpleasant to the taste. The fish which frequent it are when cooked soft and tasteless. Not a tree adorns the last hundred miles of the stream, low willows and Shepherdia being the nearest approach to arborescent growth. The lofty range of West Humboldt mountains are now in sight, whose highest point, Star Peak, rises to an altitude of nine thousand nine hundred and sixty feet above the sea. From the great height of the range, its direction north and south in conformity with the trend of the other ridges, its frequent water courses giving life and beauty to narrow belts of luxuriant vegetation, and the wide prospect to be obtained from its many commanding points, it affords numerous subjects for consideration. Many deep cañons channel its rugged

sides, most of which contain clear water. A strange fact in regard to these streams, is that they run freely, even boisterously, during the night and early morning, and dry up utterly in the lower part of their course toward noon. The power of the sun is such as to totally evaporate the water before it reaches the plains, while the powerful radiation during the night allows the stream to resume its proper dimensions. If a handkerchief be saturated with water at noonday and then flirted in the air, it becomes dry in a moment, thus indicating the wonderful absorptive power of the atmosphere. Rains are so infrequent in summer that it becomes a cause of wonders, not that the rills should fail, but that they should ever flow. Along these little streams willows, aspens (*Populus tremuloides*), Cornus, Shepherdia and elders (*Sambucus*) grow most abundantly, and Clematis with its feathery plumes waves over all. The herbage is peculiarly interesting also, columbines (*Aquilegia formosa*), asters and solidagos, leading us away in spirit to where their beauteous kindred smile upon the New England autumn, while the gilia (*G. pulchella*) and lupines are equally lovely though less familiar. Away from the streams the wild sage only thrives, if so wretched a specimen of vegetable life can be said to flourish. By far the greater mass of the mountains is desert, like the plains they overlook. The great, brown earth waves roll down into the valleys unrelieved by a dash of green, except where some sombre juniper fights its hard battle for life. Variously colored lichens occur on all the rocks, and an occasional tuft of moss on those exposed to the streams, but ferns are nowhere seen. High up on the range is found a luxuriant growth of a species of Ceanothus, and at seven thousand feet or thereabouts, the sage yields to the western juniper (*Juniperus occidentalis*) and mountain mahogany (*Cercocarpus ledifolius*). The latter is a handsome tree, averaging twenty feet in height, with bright glossy leaves, whose revolute margins conceal the brown scurf of their inferior surfaces. Its silvery bark, the

strangely plumose fruit and shining leaves render it very conspicuous. As in the case of the manzanita (*Arctostaphylla glauca*) of California, the wood is susceptible of a high polish and is used for many ornamental purposes. This tree and the juniper form the only respectable fuel which the country affords, and the traveller may consider himself especially blessed if he lights upon either when frantically searching for the wherewithal to kindle a blaze. The juniper is the more common tree, and is sometimes twenty or more feet in height. The wood is lighter colored and appears scarcely so compact as our eastern red cedar, which in other respects it closely resembles.

The character of the vegetation is quite different on opposite sides of the same range, many plants being found on one side which are not at all represented on the other. As a rule the eastern exposure is the more fertile. Instances of this peculiar distribution are the little alpine potentilla (*Ivesia Newberryi*) found in chinks and crevices of high exposed granite bluffs on the western side, and a curious moss-like Spiraea (*tomentosa*) only found in somewhat similar locations on the eastern side. A few eastern weeds thrive about the houses in Unionville, and I also found *Ranunculus cymbalaria* at quite an altitude in the cañons. This fact does not speak well for the soil, as this little plant generally favors the sea-shore or neighborhood of saline springs. A wild tobacco (*Nicotiana*) is common, which the Indians called "pah! monh!" pronounced as two interjections, and with much the sound of a person vigorously smoking an obdurate pipe. They informed us that it was formerly much used by their tribe, until superseded by the superior article of the white men. The fleshy roots of a Phelipaea they told me they employed as food in the month of October.

The view from the West Humboldt Mountains is very extensive and remarkable. The atmosphere is so pure in this region that it is possible to see a distance of sixty miles as readily as one could twenty at home. From this great

height range beyond range is seen both east and west, and there seems to be no limit to our vision. No positive colors enliven the landscape, giving it the pleasing variety of our eastern scenery, but there are only varying tints of brown in the foreground and light azure in the distance. The remote hills look as if merely outlined in blue. The valleys are dreary wastes, through which the roads may be seen winding. From these clouds of dust often rise a thousand feet into the still air. The dreary monotony of the desert is relieved at this distance by the broad plains of snow-white alkali, which it is well to view afar off. They have no fascination for the unfortunate traveller who inhales their smarting dust, penetrating as it does the eyes, nose and ears, and imparting a nauseous soapy taste to the mouth. These deposits often contain embedded crystals of rock-salt of great beauty.

About sunset is the proper time to really enjoy the weird prospect, for the colors the mountains then assume are most charming. The main masses look as if dusted with gold, while each cañon and ravine is filled with purple shadows. The delicate tints change rapidly, deepening and blending until finally night drops its curtain on the scene. Still the act is not closed, for the stars twinkle above the serrated outline of the mysterious mountains, or the moonlight transfigures their barren slopes.

When we study each detail of this anomalous scenery in its horrible individuality it seems unreasonable that the whole should in any way delight us, yet that it is fascinating is most certain. There is a peculiar coloring, or rather tinting, seen nowhere else, and never to be forgotten. I do not mean to say that the land is anything but a desert—a literal "howling" wilderness, nor do I maintain with many of the settlers that earth has no fairer habitations. It is an insult to a forest to call it a wilderness in the above sense, teeming as it is with myriad forms of life and beauty, but here where nothing interrupts the view but bare, treeless

mountains, is solitude complete and unbroken. Whatever be the charm, it is yet certain that having gazed once we admire the strange picture ever after.

REVIEWS.

REPORT UPON DEEP SEA DREDGINGS IN THE GULF STREAM.*—This number of the Bulletin sums up the results of the different expeditions, and is also especially valuable for many novel and interesting observations upon geological and zoölogical questions. According to Professor Agassiz, the fauna of the reef, consisting mainly of corals, extends to ten fathoms only. The second zone, "a muddy mass of dead and broken shells, broken corals, and coarse coral sand, is chiefly inhabited by worms, and such shells as by their nature seek soil of this character, with a few small species of living corals, some *Halcyonarians*, and a good many *Algæ*." This extends seaward "from a few miles" off Cape Florida to "twenty miles and more off Cape Sable." "A third region, or zone, beginning at a depth of about fifty or sixty fathoms, and extending to a depth of from two hundred to two hundred and fifty fathoms, constitutes a broad slanting table land, beyond which the sea bottom sinks abruptly into deeper waters. The floor of this zone is rocky; it is, in fact, a limestone conglomerate, a kind of lumachelle, composed entirely of the remains of organized beings, animals now living upon its surface." Algæ are but sparsely represented upon the plateau, and though the animals are abundant, the species are generally of small size and belong to genera either identical or closely allied to those of the Cretaceous period. The deep sea proper beyond this zone lies upon "a uniform accumulation of thick, adhesive mud, with a variety of worms and such shells as seek muddy bottoms." Professor Agassiz thinks that if the bottom in these depths was rocky, animal life would be "as varied and as numerous comparatively as are the Alpine plants on the very limits of perpetual snow."

With reference to geology, Professor Agassiz says that he infers from the character of the sea bottom that probably none of the layers of stratified rock on the surface of the globe "have been formed in very deep waters," but around the shore lines of the ancient continents, which have been subject only to comparatively slight changes of level after they were once elevated above the primeval ocean.

In the main bearing of this conclusion Professor Agassiz agrees with

* Bulletin of the Museum of Comparative Zoology. No. 13. Report upon Deep Sea Dredgings in the Gulf Stream during the Third Cruise of the U. S. Steamer Bibb; addressed to Professor B. Peirce, Supt. U. S. Coast Survey. By Louis Agassiz. pp. 363-386. Cambridge, 1869.

Dana's theory of the gradual development of continents, a view which of late has been steadily gaining in adherents, especially in this country. The statement, however, that probably no stratified rock has been formed in deep water is open to serious objections. The Chalk, the Nummulitic limestone, the Eozoonal limestone and others of like constitution are composed in great part of Foraminiferous animals especially fitted to flourish at great depths, and, probably, so far as we can judge from soundings and dredgings, covering at the present day a large portion of the Atlantic bottom.

The description of the physical contrast between the shelving of the Florida shore and the abruptness of the Cuban side and Bahama reefs, with the minute analysis of the formation and disintegration of the rocks of the Double Headed Shot Key, Salt Key, and others, will be read with the greatest interest by all geologists. We could not do justice to this part of the publication without quoting several entire pages, and this we have not space for.

Generally speaking the Keys are formed, according to Professor Agassiz, of fine coral sand, which is washed up on to the higher shallower parts, and form banks, upon which accumulate a conglomerate of broken shells, corals and coarse oölithes to the height of high water mark. Upon this foundation rock reposes another accumulation of similar material, distinguished, however, by the steep inclinations of the beds which rise to the height of twelve or fifteen feet. These last furnish the fine material which is swept away by the wind to form sand dunes.

The more homogeneous limestones are formed in the less exposed places, and Professor Agassiz mentions that these are "frequently as hard as the hardest limestone of the secondary formation."

The author then passes to the consideration of the development of Corals, and states that these investigations have led him to regard the *Actinians* as the lowest; the *Madreporarians* next; and the *Halcyonarians* as the highest among the corals. Among the Madrepores the sequence of the genera is *Turbinolia*, *Fungia*, *Astræa* and *Madrepora*. "Young Astræans, before assuming their solid frame, are Actinia-like; their first coral frame is Turbinolia-like, and from that stage they pass into a Fungia-like condition, before they assume their characteristic Astræan features." It is next proved, that the succession of types in geological times, and their bathymetrical distribution from the deepest water to the shallow, corresponds so far as the Madreporarians are concerned to the succession in rank of the adult types as determined by different phases of their development. Thus both as regards rank in classification, and the succession of the different phases of development, as well as the successive appearance of types in the progress of geological time, and the vertical distribution of these types on the seashore, the Turbinolian type is found first and is followed in succession by the Fungian, the Astræan, and the Madreporian types. These views also seem to be in accord with those of Alexander Agassiz, who, as previously cited, com-

pares the deep water Echinoids to the Cretaceous, and those of intermediate depths to Tertiary genera. It would seem, therefore, if the latter be true, that, *a priori*, the former would acquire a still higher degree of probability, so far as the agreement of the succession in time and depth is concerned.

TRANSACTIONS OF THE CHICAGO ACADEMY OF SCIENCES.*—This part completes the first volume of "Transactions" and in interest and value, and the beauty of the plates, fully maintains the high standard of the preceding part. The plates, which are costly, are presented by the Trustees of the Academy, an evidence of their immediate interest in the scientific and literary reputation of their city. Nearly half of the volume is devoted to a biography of Robert Kennicott, the first Director of the Academy, from the pen of Dr. Stimpson, his successor, and the editor of the present volume. It will be read with great interest as the record of a daring explorer and admirable field naturalist.

Dr. J. W. Foster contributes an exceedingly interesting paper "On the Antiquity of Man in North America." Among the proofs of his great antiquity he claims that "the discovery (by Professor Whitney) of a human skull in California during the past season, buried deep in the gold drift, and covered with five successive overflows of lava, carries back the advent of man to a period more remote than any evidences thus far afforded by the stone implements in the drift of Abbeville and Amiens, in the valley of the Somme, or the human skeleton in the loess of the Rhine; and although the fossil elephant (*E. primigenius*) existed in Europe during the glacial epoch, and survived through the valley-drift and loess (which I think may be regarded as contemporary, though different in the form of the materials, and indicating a difference in the transporting power of the current), this association of the remains of the elephant and man has not thus far been found to exist in the purely glacial deposits." He also cites the statement of the late Dr. Koch, that in connection with the remains of the Mammoth found in the Osage valley of Missouri, "were found flint arrowheads and remains of charcoal, as though the aborigines had attacked and destroyed the animal when mired. This statement was received at the time, by the scientific world, with a sneer of contempt. Last spring I questioned him as to the possibility of his having been mistaken, when he assured me, in the most solemn and emphatic manner, that it was true."

He describes the remains of the mound builders, figuring various implements, and recapitulates the evidence of their "advance in civilization beyond a mere barbaric race," as drawn from their textile fabrics, comprising cloth "possessing an uniform and well twisted thread, coarse, and of a vegetable fibre, allied to hemp," and "regularly spun with an uniform thread, and woven with a warp and woof." It was taken from two

* Vol. i, Part II. Chicago, 1869. Royal 8vo, pp. 133 to 337. With a portrait and thirteen plates, mostly colored.

mounds in Ohio. He closes with a chapter on the "Parallelism as to the Antiquity of man on the two Hemispheres." The remaining articles are "Descriptions of certain Stone and Copper Implements used by the Mound Builders," by J. W. Foster, LL. D. "List of the Birds of Alaska, with Biographical Notes," by W. H. Dall and H. M. Bannister. "On Additions to the Bird Fauna of North America, made by the Scientific Corps of the Russo-American Telegraph Expedition," by S. F. Baird, and "A preliminary List of the Butterflies of Iowa," by S. H. Scudder.

GEOLOGY OF THE MISSOURI RIVER VALLEY.*—This is the final report of the interesting series from the able hands of Drs. Meek and Hayden, which have been already published. This Report also includes one made by Dr. Hines on a portion of the route, and another by Professor Newberry, on the Cretaceous and Tertiary plants, already reviewed in the NATURALIST. A careful perusal of the latter, and of Dr. Hayden's chapter on the Physical Geography of the region surveyed would give many of our readers new ideas with regard to their own country. The typographical errors in the work are numerous, since it was printed during the absence of the author, who read no proof of it. The historical introduction reviews the labors of previous explorers, and contains interesting remarks with regard to maps. These are especially opportune as drawing attention to the very fine specimen of map printing which is attached to the present report. The colors are excellent and its size and variety of details gives one a very clear idea of the geological structure of the Great Missouri Valley.

The chapter on physical geography contains a resumé of the results of the barometrical profiles run by the different western government expeditions, showing the general rise of the country west of St. Louis, to the base of the Rocky Mountains. Dr. Hayden regards the whole country west of the Mississippi as a vast plateau, which was gradually elevated to its present height, the strain bursting the central axis of the plateau and giving birth to the numerous chains or parallel ranges of the Rocky Mountains. Dr. Hayden describes only two types of these mountains, those having a granite nucleus and regular outline, and those composed of erupted rocks, which "are very rugged in their outlines and irregular in their trend." The author regards the Black Hills as an example of the regular type, and describes the stratified rocks as lying against the nucleus, or kernel, of granite without a break or any unconformability on either side of the axis of elevation to the latest period of the Cretaceous formation." From these facts we draw the inference that prior to the elevation of the Black Hills, which must have occurred after the deposition of the Cretaceous rocks, all of these formations presented an unbroken continuity over the whole area occupied by these mountains. This is an

* Geological Report of the Exploration of the Yellowstone and Missouri Rivers, by Dr. F. V. Hayden, assistant under the direction of Captain (now Lieut. Col., and Brevet Brig. General) W. F. Raynolds. 1859-60. Washington, 1869. 8vo, pp. 174.

important conclusion, and we shall hereafter see its application by other ranges, and also to the Rocky Mountain range taken in the aggregate."

From evidence of a similar nature the Laramie Mountains, the Big Horn and Wind River Mountains are shown to have been elevated at some time during the Tertiary period.

"In this connection I have thought it best to remark more systematically in regard to the principal rivers that drain this immense area of country. The Missouri River and its tributaries form one of the largest as well as most important hydrographical basins in America. It drains an area of nearly or quite 1,000,000 square miles. Taking its rise in the loftiest portion of the Rocky Mountains, near latitude 44°, longitude 113°, it flows northward in three principal branches, Madison, Gallatin, and Jefferson forks, to their junction, and then proceeds onward until it emerges from the gate of the mountains, a distance of nearly 200 miles; it then bends to the westward, flowing in this direction to the entrance of White Earth River, a distance of nearly 500 miles; it then gradually bends southward and westward to its junction with the Mississippi, a distance of 1,500 to 2,000 miles. The branches which form the sources of the Missouri rise in the central portions of the Rocky Mountain range, flowing through granitic, basaltic, and the older sedimentary rocks until it emerges from the gate of the mountains, when the triassic and jurassic are shown. The falls of the Missouri, extending for a distance of 20 or 30 miles, cut their way through a great thickness of compact triassic rocks. Below the falls the channel makes its way through the soft yielding clays and sands of the Cretaceous beds for about 250 miles, with the exception of the Judith tertiary basin, which is about 40 miles in length. The Cretaceous beds continue extending nearly to the mouth of Milk River, where the lignite tertiary formations commence. These are also composed of sands, marls and clays, as the character of the valley will show. The river flows through these tertiary rocks to the mouth of Heart River below Fort Union, a distance of nearly 250 miles, where the Cretaceous rocks come to the surface again. These latter rocks extend nearly to Council Bluffs, a distance of over 500 miles. I have estimated the distances in a straight line as nearly as possible. Just above Council Bluffs the coal measure limestones commence, and the valley of the Missouri gradually becomes more restricted, though it is of moderate width even below the mouth of the Kansas.

"The Yellowstone River is by far the largest branch of the Missouri, and for 400 miles from its mouth up it seems to be as large as the Missouri itself from Fort Union to Fort Pierre. It is navigable for large steamers during the spring and early summer for 300 to 400 miles above its junction with the Missouri. This river also takes its rise in the main divide of the Rocky Mountains, near latitude 44 1-2° and longitude 110°, in a lake, as some suppose, called Yellowstone lake, which is about 60 miles long and 10 to 20 wide. Its channel is formed in rocks similar to that of the Missouri, about 400 miles of its course passing through lignite tertiary beds. The character of its valley is very similar to that of the Missouri. Most of the important branches of this river I have alluded to in the preceding portion of this chapter. Tongue and Powder Rivers, which are quite long branches, have their origin in the Big Horn Mountains, their channels cutting through the different rocks that surround the Big Horn range. Tongue River is nearly 150 miles in length, and flows for the most part through the soft yielding rocks of the lignite tertiary. Powder River is from 250 to 300 miles in length, and also flows nearly all its course through the same tertiary beds as Tongue River.

Chapter II. on the "System of Geological Formations in the Northwest." Chapter XII. on Geological Explorations in Kansas, and Chapter XIII. "Tour to the Bad Lands of Dakota," in 1866, will be found of especial value to the student of American Geology.

PETITES NOUVELLES ENTOMOLOGIQUES.* — This entomological newspaper published on the 1st and 18th of each month, contains a résumé of news interesting to entomologists, and will be useful to all who wish to keep themselves informed in current entomological information.

---

* Subscription (for North America) $1.20 a year post free. All communications to be addressed to Mr. E. Deyrolle, fils, 19 Rue de la Monnaie, Paris. American subscribers can remit in two or three cent postage stamps.

NATURAL HISTORY MISCELLANY.

BOTANY.

LARGER BUR-MARIGOLD.—In the last edition of the "Manual," Prof. Gray ascribes to *Bidens chrysanthemoides* a maximum height of two and a half feet. The writer has recently observed this species growing to the prodigious height of from six to eight and two-thirds feet. The locality of these large specimens is near a spring in Pratt Co., Illinois. We tried to trace in these overgrown plants evidences of hybridization with *B. frondosa*, which was growing in the same spot, but could detect none in either leaves, flowers or fruit. Lest the mere record of such a remarkable growth should seem incredible to some, we preserved a specimen measuring eight feet eight inches; stripping it of its branches, of course, except a few terminal ones bearing leaves and flowers sufficient for identification. The species in question almost always surpasses in this district the maximum size allowed it by our authors, as indeed do many other plants. I should add that the specimens of *B. frondosa* of the locality referred to were equally as tall but *not taller* than those of *B. chrysanthemoides*. *Panicum crus-galli* Linn. grows in our low prairies (apparently indigenous) to the height of six or seven feet; and *Lysimachia ciliata* to from three to five, rather than "two to three," as Professor Gray says. But scores of other species might be mentioned which seem constantly to outgrow themselves on our western soils. The flora of the United States as it is now known seems remarkable for various forms of the same species; and although future studies will probably identify as distinct species many forms now regarded as only varieties, yet remarkable differences in the size of the same species in different localities will be a more notable feature of our flora when the plants of the east and the west, the north and the south, shall have been more thoroughly studied and more diligently compared.—EDWARD L. GREENE, *Decatur, Illinois.*

THE YELLOW-FLOWERED SARRACENIA PURPUREA.—The remarks of Mr. Tracy, on page 327 of the NATURALIST, have somewhat surprised me, as the form of *Sarracenia purpurea* L., there described, though rather rare, has been long and well known. (See Gray's Manual, etc.) This is, I presume, no other than the *S. heterophylla* Eaton, and *S. purpurea*, var. *heterophylla* Torr. Under the latter name, Wood, in describing it says it has been found at Northampton, Mass. It may be interesting to state in this connection, as showing its distribution, that I collected this form (a specimen of which I preserve in my herbarium) more than two years ago, on the south shore of Lake Superior, about thirty miles east of Marquette, Michigan. It grew with the common form. In my plant the leaves were without purple veins, or had them but very few and pale.

As to its being a transition state, on its way to full whiteness, that is a point open to question. I do not know that the flower has ever been found white.

Those who so strongly insist on the relation of vital force to color would seem to be sustained in this one fact, that in almost all white varieties (white being taken as absence of color) the foliage, stem, sepals, etc., appear to sympathize, and are at least much paler than usual. But this will not be admitted as conclusive. — HENRY GILLMAN, *Detroit, Mich.*

AREAS OF PRESERVATION. — Although distribution is one of the strongest points of the derivative doctrine, yet it is wonderful to see, in the light of this sober and impartial survey [Bentham's address on Geographical Biology to the Linnæan Society, 1869], how entirely the whole aspect of philosophical natural history in this regard has changed within two decades. "Centres of creation" and the like are of the language of the past, here replaced by Bentham's happy term of "Areas of Preservation." And the conclusion tardily reached "that the present geographical distribution of plants was in most instances a derivative one, altered from a very different former distribution," has been followed by the conviction that the present species themselves are equally derivative, and have a changeful history, some steps in which may be dimly surmised by the study of cognate forms, extant or fossil. At the point now reached, if not by general yet by large consent, the problems we are led to consider are such that it is indispensable to have a term of wider application than "species" technically means; and Mr. Bentham here appropriates to this use the word *Race*, to denote either permanent variety (the old meaning of the word when definitely restricted), or species, or groups of two or more near and so-called representative species, *i. e.*, for those collections of individuals, or resembling groups of individuals, whose association in the way of lineage is taken for granted by this class — or rather by these classes — of naturalists. As the term was only beginning to get fixity in its restricted sense, it will take the wider sense without confusion or difficulty, and with the advantage of a vernacular instead of a newly coined purely technical word. — A. GRAY, *in American Journal of Science.*

LEAVES OF CONIFERÆ. — At the meeting of the Philadelphia Academy of Natural Sciences on the 5th of January, Thomas Meehan referred to his original observations that the so-called leaves of pines were rather branchlets than leaves, and that the true leaves existed in the shape of scales which were adnate to the stem; and that these adnate leaves were partially free or adherent in proportion to the axial vigor of the tree. In some Coniferæ, the larch being a good illustration, the adherent leaves or scales, had the power of producing long foliaceous awns, which appeared as true leaves. Nothing of this kind had been found in Pinus except in the one-year-old or seedling state. He now exhibited a specimen of *Pinus serotina*, which had been sent him by Mr. W. H. Ravenel, of Aiken, South Carolina, in *which foliaceous awns, two inches long, had been*

developed from these adnate leaves, under each fascicle of branchlets (forming 3-*leaved* fascicles). This he thought demonstrated in a more remarkable manner than any observations he had yet made, the soundness of his former deductions.

He called attention to the value of these adnate leaves in affording specific characters. They differed in form and other points nearly as much from one another as the leaves of other tribes or plants. He exhibited living specimens of *Pinus Austriaca*, *P. sylvestris*, *P. maritima*, *P. rigida*, *P. pungens*, *P. mitis* and *P. glabra* Walk., to illustrate this. Some were costate, some regularly plane, others elongated, linear, ovate, obtuse, acute, regular, oblique, spathulate, gibbous, etc., etc. *Pinus glabra*, which had been confused with *P. mitis*, could readily be distinguished by these adnate leaves; and any pine could be as readily known and in some instances better known, by the adnate leaves, than the minute and often almost inappreciable difference founded on the old time leaves (fascicled branchlets) and cones.

Notes from Chicago. — Chicago has a flourishing young botanical society, the members of which meet on the first and third Saturday of each month. They have engraved upon their official seal the *Dioscorea villosa*, considering it the prettiest native twiner in this part of the country.

The flowers of the prairies are no prettier than the flowers of New York and Massachusetts. The variety is not so great; but on account of the absence of trees and shrubs some species are represented by very large numbers of specimens, making a grander display which is noticed by everybody. — W. J. B.

Photography in Botany. — To illustrate venation and the nature of the surface of foliage photography may be turned to good account, far more than is now commonly thought of. We have seen a photograph from a specimen of one of the coriaceous-leaved oaks of the Dutch Indies which was truly wonderful in its rendering. — A. Gray, *in American Journal of Science.*

[Photography in Entomology will prove of great benefit, especially in representing, with accuracy, the venation of the wings of the Hymenoptera, Lepidoptera and Diptera. We value very highly certain photographs taken for us several years ago by Professor A. E. Verrill; and Mr. Carl Meinerth of Newburyport, Mass., has taken some exceedingly good pictures of Hymenoptera and Moths. The venation of insects is exceedingly difficult to represent by the pencil, even of a facile and skilled entomologist. — Editors.]

Transformations of Parts of Flowers. — Professor Koch has found that in a fruit of *Solanum melongena*, the five anthers have been transformed into five smaller capsules. A capsule of poppy offers, in the centre of its cavity, a small elevation (the continuation of the axis), bearing a number of smaller capsules. — *Nature.*

Fertilization of Plants. — Professor Hildebrand states that plants intermediate between the Papaveraceæ and the Fumariæ gave the greatest quantity of seeds when impregnated with the pollen of another individual of the same species; less when the pollen was taken from another flower of the same individual, and least when the impregnation took place within the flower itself. For *Eschscholtzia Californica*, the proportion of seeds in these three cases was as twenty-four to nine to six. Professor Fewzl says that he obtained abundance of seeds from two species of Abutilon by fecundation with pollen from other individuals, and that these operations are best performed between eight and nine A.M. — *Nature.*

In Fours. — In the September number of the Naturalist, G. F. M. mentions a *Trillium erythrocarpum* having its parts in fours. I have in my collection a similar specimen of *T. sessile*, found on the Salamonie. Also a specimen of *T. recurvatum* from the same locality, having its parts in twos; two leaves, sepals, petals and stigmas, and four stamens.

In the November number, C. J. S. speaks of a specimen of *Zea Mays*, where the floral organs have changed offices. I have often observed this freak in the fields; grains among the staminate flowers, and staminate flowers surmounting the rachis. I have also seen the entire fascicle of staminate flowers transformed into a tuft of little green blades. — R. H. Fisher, *Arba, Indiana.*

Androgynous Inflorescence. — Such inflorescences have been found on Zea, Populus, Fagus, Carpinus, *Betula humilis* and *B. alba*, as also on *Pinus nigra;* the small scale, considered as a part of the female blossom, developing itself into an anther. — *Nature.*

ZOÖLOGY.

Relation of the Physical to the Biological Sciences. — With reference to those branches of science in which we are more or less concerned with the phenomena of life, my own studies give me no right to address you. I regret this the less because my predecessor and my probable successor in the presidential chair are both of well-known eminence in this department. But I hope I may be permitted, as a physicist, and viewing the question from the physical side, to express to you my views as to the relation which the physical bear to the biological sciences.

No other physical science has been brought to such perfection as mechanics; and in mechanics we have long been familiar with the idea of the perfect generality of its laws, of their applicability to bodies organic as well as inorganic, living as well as dead. Thus in a railway collision, when a train is suddenly arrested the passengers are thrown forward, by virtue of the inertia of their bodies, precisely according to the laws which regulate the motion of dead matter. So trite has the idea

become that the reference to it may seem childish; but from mechanics let us pass on to chemistry, and the case will be found by no means so clear. When chemists ceased to be content with the mere ultimate analysis of organic substances, and set themselves to study their proximate constituents, a great number of definite chemical compounds were obtained which could not be formed artificially. I do not know what may have been the usual opinion at that time among chemists as to their mode of formation. Probably it may have been imagined that chemical affinities were indeed concerned in their formation, but controlled and modified by an assumed vital force. But as the science progressed many of these organic substances were formed artificially, in some cases from other and perfectly distinct organic substances, in other cases actually from their elements. This statement must indeed be accepted with one qualification.

It was stated several years ago by M. Pasteur, and I believe the statement still remains true, that no substance, the solution of which possesses the property of rotating the plane of polarization of polarized light had been formed artificially from substances not possessing that property. Now several of the natural substances which are deemed to have been produced artificially are active, in the sense of rotating the plane of polarization, and therefore in these cases the inactive artificial substances cannot be absolutely identical with the natural ones. But the inactivity of the artificial substance is readily explained on the supposition that the artificial substance bears to the natural the same relation as racemic acid bears to tartaric; that it is, so to speak, a mixture of the natural substance with its image in a mirror. And when we remember by what a peculiar and troublesome process M. Pasteur succeeded in separating racemic acid into the right-handed and left-handed tartaric acids, it will be at once understood how easily the fact, if it be a fact, of the existence in the natural substance of the mixture of two substances, one right-handed and the other left-handed, but otherwise identical, may have escaped detection. This is a curious point, to the clearing up of which it is desirable that chemists should direct their attention. Waiving then the difference of activity or inactivity, which, as we have seen, admits of a simple physical explanation, though the correctness of that explanation remains to be investigated, we may say that at the present time a considerable number of what used to be regarded as essentially natural organic substances have been formed in the laboratory. That being the case it seems most reasonable to suppose that in the plant or animal from which those organic substances were obtained they were formed by the play of ordinary chemical affinity, not necessarily nor probably by the same series of reactions by which they were formed in the laboratory, where a high temperature is commonly employed, but still by chemical reactions of some kind, under the agency in many cases of light, an agency sometimes employed by the chemist in his laboratory. And since the boundary line between the natural substances which have, and those which have not,

been formed artificially is one which, so far as we know, simply depends upon the amount of our knowledge, and is continually changing as new processes are discovered, we are led to extend the same reasoning to the various chemical substances of which organic structures are made up.

But do the laws of chemical affinity, to which, as I have endeavored to infer, living beings, whether vegetable or animal, are in absolute subjection, together with those of capillary attraction, of diffusion, etc., account for the formation of an organic structure, as distinguished from the elaboration of the chemical substances of which it is composed? No more, it seems to me, than the laws of motion account for the union of oxygen and hydrogen to form water, though the ponderable matter so uniting is subject to the laws of motion during the act of union just as well as before and after. In the various processes of crystallization, of precipitation, etc., which we witness in dead matter, I cannot see the faintest shadow of an approach to the formation of an organic structure, still less to the wonderful series of changes which are concerned in the growth and perpetuation of even the lowliest plant. Admitting to the full as highly probable, though not completely demonstrated, the applicability to living beings of the laws which have been ascertained with reference to dead matter, I feel constrained, at the same time, to admit the existence of a mysterious *something* lying beyond — a something *sui generis*, which I regard, not as balancing and suspending the ordinary physical laws, but as working with them and through them to the attainment of a designed end.

What this *something*, which we call life, may be, is a profound mystery. We know not how many links in the chain of secondary causation may yet remain behind; we know not how few. It would be presumptuous indeed to assume in any case that we had already reached the last link, and to charge with irreverence a fellow-worker who attempted to push his investigations yet one step farther back. On the other hand, if a thick darkness enshrouds all beyond, we have no right to assume it to be impossible that we should have reached even the last link of the chain; a stage where farther progress is unattainable, and we can only refer the highest law at which we stopped to the fiat of an Almighty Power. To assume the contrary as a matter of necessity, is practically to remove the first cause of all to an infinite distance from us. The boundary, however, between what is clearly known and what is veiled in impenetrable darkness is not ordinarily thus sharply defined. Between the two there lies a misty region, in which loom the ill-discerned forms of links of the chain which are yet beyond us. But the general principle is not affected thereby. Let us fearlessly trace the dependence of link on link as far as it may be given us to trace it, but let us take heed that in thus studying second causes we forget not the first cause, nor shut our eyes to the wonderful proofs of design which, in the study of organized beings especially, meet us at every turn. — *President Stokes' Address to the British Association.* SCIENTIFIC OPINION.

NOTES ON THE DUCKS FOUND ON THE COAST OF MASSACHUSETTS IN WINTER. — [A sporting friend in Salem sends the following interesting notes on our winter ducks, which, though differing somewhat from the published opinions of some writers, accord in the main with notes in previous lists of the birds of Massachusetts. While adding to our ornithological record many facts of special interest in respect to the distribution of our ducks in winter, they are also important as confirmatory in the main of what has been previously written]: On looking over the "List of New England Birds" I find some statements that are not in accordance with my own experience as a sportsman.

Mallard (*Anas boschas* Linn.). "Winter resident; not abundant." This is not a diving duck, but feeds the same as our tame ducks, and is usually found in fresh waters. I have never seen it here in winter. Perhaps a bird wounded in the fall may stay over, but *I* never saw any in winter. They are not plenty even on the Chesapeake waters after the last of November, but go still farther south. A *few* may be shot on the Jersey marshes in winter.

Pintail Duck (*Dafila acuta* Jenyns). "Chiefly along the coast. Winter resident; not abundant." I have never found one of these ducks here in winter. This is also not a duck that dives for its food (and hence cannot feed in deep water). It is usually a very timid duck, and constantly on the watch. On the Delaware, in spring, considerable numbers are shot. By some it is called Spring-tail.

Scaup Duck (*Fulix marila* Baird). "Winter resident." I never saw one of these here in winter. Some are found at that season in Long Island Sound and on the south side of Long Island. A few also winter on the south side of Cape Cod.

Red Head (*Aythya Americana* Bon.). "Winter resident." None to my knowledge winter here. They are a strong diver, and can get their food even in winter, if they will eat the same kind of food that our Coot and Old Squaw live on.

Canvasback (*Aythya vallisneria* Bon.). "Chiefly winter resident; not abundant." Very seldom if ever seen in our waters. A very few have been shot. A few may be found in the waters near New York.

Golden Eye (*Bucephala Americana* Baird). "Common winter resident." Winters from Florida to Maine. There are always large numbers to be seen any calm day in winter from our lower gunning house on Rowley River.

Buffel Head (*Bucephala albeola* Baird). "Abundant winter resident." Stay late in fall and come early in spring; but few, if any, winter here.

Black Duck (*Anas obscura* Gm.). "Resident." There is a *small* variety of this duck that always winters with us and can be procured at any time when the weather is favorable, from September to April. But in early spring the more southern ducks of this species come north and stop a little time here. They are considerably larger than those that winter in our bays. The ducks of this species usually spend the day at sea and

return towards evening to the flats and marshes to feed, for they are not a duck that dives for its food, but tilt up as our puddle ducks do when feeding.

All the species here mentioned may have been seen and shot by others, but so far as I have observed only Coots, Eiders, Black Ducks, Velvet Ducks and Scoters winter here. Since most ducks are strong fliers, capable of travelling forty to sixty miles an hour, it would take but about one night's flight for them to reach us from Long Island Sound or even the Delaware waters, and a few warm days may be sufficient to tempt some here, now and then, that are not probably winter residents, a fact that may have been overlooked by some who may have observed certain of them here in winter.

Is Huxley's Bathybius an Animal?—In the "Microscopical Journal" for October, 1868, is a memoir by Professor Huxley, "On some organisms living at great depths in the North Atlantic Ocean," in which he states that the stickiness of the deep-sea mud is due to "innumerable lumps of a transparent gelatinous substance," each lump consisting of *granules, coccoliths,* and *foreign bodies,* embedded in a transparent, colorless, and structureless matrix." The granules form heaps which are sometimes the one-thousandth of an inch or more in diameter. The "granule" is a rounded or oval disc, which is stained yellow by iodine, and is dissolved by acetic acid. "The granule heaps *and* the transparent gelatinous matter in which they are embedded, represent masses of protoplasm." One of the masses of this deep-sea "urschleim," may be regarded as a new form of the simplest animated beings (*Moner*), and Huxley proposes to call it *Bathybius.* The "*Discolithi* and the *Cyatholithi,*" some of which resemble the "granules," are said to bear the same relation to the protoplasm of *Bathybius* as the spicula of sponges do to the soft parts of those animals; but it must be borne in mind that the spicula of sponges are embedded in a matrix, which is formed by and contains, beside the spicula, small masses of living or germinal matter. As in other cases, this matrix, with the living matter included, constitutes the "protoplasm" of Mr. Huxley.

Dr. Wallich has, however, arrived at a very different conclusion. In a paper "On the Vital Functions of the Deep-sea Protozoa," published in No. 1 of the "Monthly Microscopical Journal," January, 1869, this observer, who has long been engaged in this and kindred studies, states that the coccoliths and the coccospheres stand in no direct relation to the protoplasm substance referred to by Huxley, under the name of *Bathybius.* The former are derived from their parent coccospheres, which are independent structures altogether. "*Bathybius,*" instead of being a widely extending *living* protoplasm which grows at the expense of inorganic elements, is rather to be regarded as a complex mass of slime with many foreign bodies and the *debris* of living organisms which have passed away. Numerous living forms are, however, still found on it.

Dr. Wallich is of opinion that each coccosphere is just as much an independent structure as *Thalassicolla* or *Collosphæra*, and that, as in other cases, "nutrition is effected by a vital act," which enables the organism to extract from the surrounding medium the elements adapted for its nutrition. These are at length converted into its sarcode and shell material. In fact, in these lowest, simplest forms we find evidence of the working of an inherent vital power, and in them nutrition seems to be conducted on the same principle as in the highest and most complex beings. In all cases the process involves, besides physical and chemical changes, purely *vital actions*, which cannot be imitated, and which cannot be explained by physics and chemistry. — LIONEL BEAL, *in Monthly Microscopical Journal.*

REASON AND INSTINCT. — Under this title Sir S. W. Baker, devotes a chapter of his "Eight Year's Wanderings in Ceylon," to symptoms of the reasoning faculty in animals, and narrates a story of his hound "Bluebeard," which was called to mind by your account of the Spider and Mud-wasp on page 391 of the September NATURALIST. To condense a little, the facts were these: "Sir Samuel was hunting in a rolling country divided by jungles into so-called patinas, with a large and deep river flowing through the centre. The pack had disappeared, but after a long time spent in searching for them, Sir Samuel saw from one of the grassy knolls that commanded the patina, an elk swimming out from the jungle, and succeeded with the gray hounds, remaining by him, in running her down shortly after she landed:

"We were cutting up the elk, when we presently heard old Bluebeard's voice far away in the jungle, and, thinking he might perhaps be running another elk, we ran to a hill which overlooked the river, and kept a bright lookout. We soon discovered that he was true upon the same game, and we watched his plan of hunting, being anxious to see whether he could hunt upon an elk that had kept to water for so long a time.

On his entrance to the patina by the river's bank, he immediately took to water and swam across the stream; here he carefully hunted the edge for several hundred yards down the river, but, finding nothing, he returned to the jungle at the point from which the river flowed. Here he again took to water, and, swimming back to the bank from which he had at first started, he landed and made a vain cast down the hollow. Back he returned after his fruitless search, and once more he took to water. I began to dispair of the possibility of his finding; but the true old hound was now swimming steadily down the stream, crossing and recrossing from either bank, and still pursuing his course down the river. At length he reached the spot where I knew that the elk had landed, and we eagerly watched to see if he would pass the scent, as he was now several yards from the bank. He was nearly abreast of the spot, when he turned sharp in and landed in the exact place; his deep and joyous note rung across the patinas, and away went the gallant old hound in full cry upon the scent, while I could not help shouting, 'Hurrah for old Bluebeard!' In a few minutes he was by the side of the dead elk — a specimen of a true hound, who certainly had exhibited a large share of reason.'" — P.

MALFORMATIONS IN INSECTS. — In the summer of 1868 I observed on several occasions along the south shore of Lake Superior, specimens of the Dragon-fly with a curious malformation, or arrest of development of the wing. In an individual I specially observed, the skin had just been cast, and the wings, not having yet hardened, were quite soft and delicate to the touch. In one of the wings was a lump-like unexpanded portion reducing the size of the limb nearly one-half. The malformation was

similar in each of the instances noticed by me, and was so serious as to prevent the flight of the insect, it invariably falling to the ground on being thrown into the air, and being quite unable to raise itself.

A like deformity, with like results, I had previously found to be not uncommon in the Ephemera, which is produced in such countless multitudes in the lake region. The only wonder is that creatures so fragile that almost the touch of a finger injures them, should be brought into existence in such myriads, generally unharmed and perfect.

I saw two examples of a more singular case of malformation in the beautiful pale green Moon-moth (*Actias Luna*). The wing was similarly dwarfed or contracted, a large portion towards the extremity being unexpanded and hardened. The coloring matter and fluids which should have passed down to perfect the development remained above in greenish blisters, protruding the skin of the wing on each side. On breaking this the contents escaped. By pressing those blisters it was possible to project the colored fluid in any direction within the wing; the motions being quite perceptible in the increased brilliancy of color of the parts where the fluid passed. — HENRY GILLMAN, *Detroit, Michigan.*

THE COTTON OR ARMY WORM OF THE SOUTH. — The Secretary (of the Entomological Society of London) read a communication respecting the injury done to the cotton crop in Louisiana by the "Army Worm," the larva of *Heliothis armigera* (undoubtedly the *Anomis xylina*. Eds.)

"It stated that the crop was in danger of being entirely eaten up. Some years ago the planters of Louisiana, tempted by the high price of cotton, which was then selling at fifteen pence a pound, began to cultivate cotton, which had been almost abandoned. The sugar-cane became of secondary importance; but the caterpillars arrived, and swept away the hopes of the planters in a few days The noise made by the multitudes of the voracious insects was described as audible at the distance of a mile, and to resemble the crackling of a house on fire. It was thought for a long time that the Army worm only visited Lower Louisiana, but this was an error; in 1788, these insects destroyed two hundred and eighty tons of cotton in the Bahamas; they caused the cultivation of cotton to be given up in many of the West Indian Islands, and the case was almost the same in Egypt; in 1793 this insect visited Georgia, and in 1800 it ravaged South Carolina; four years later they descended on the whole of Louisiana; and in 1825 they ravaged the whole of the Southern States, and it was very difficult even to get seed for the following year. The last general visitation was in 1845. The Army worm appears often in Guiana and other parts of South America."

BLACKBIRDS IN WINTER. — Since the first week in December there have been two, and part of the time three, Rusty Blackbirds constantly about one of my barns. At the same locality a number of Cow Blackbirds were seen last winter and the winter before. They appeared about the middle of November, and left the last of March. Sometimes only three or four were observed, but the highest number seen was nineteen. They were usually very tame, allowing one to approach within eight or ten feet of them. Their only note was a sort of a whistle, uttered while sitting on the top of an apple-tree. The Cow Blackbirds were usually very active, but the Rusty Blackbirds seemed much pinched with cold, and in cold days sat crouched down on their feet. — ROBERT HOWELL, *Nichols, Tioga County, N. Y.*, Jan. 11, 1870.

How the Sculptured Turtle (*Glyptemys insculpta* Ag.) deposits her eggs. — [The following was given to me by Mr. Frank Gammons, of West Newton. I think it exceedingly interesting, and send it for publication. — C. J. M.]

I was passing through a cornfield in Weston, when I observed a turtle scratching about a hill of corn with one of her forefeet. I paused and watched her movements. She went to half a dozen or more hills, and seemed to try them, but for some reason they did not suit her; finally she came to one where she began to dig in earnest with both forefeet; turning around with her hind-feet acting as a pivot she continued to dig until she had formed a complete circle with the dirt thrown in the centre. She then reversed her position by placing her forefeet in the centre and *supporting herself by these alone*, she with her hind-feet threw out the earth; at the same time turning around until the hole was about six inches deep and about thirteen inches in diameter. She then began to tread it down hard on the bottom. She then came out to the edge and immediately deposited eighteen eggs, with the space of about a minute between each deposit. Sometimes two would come out very nearly together. When she had finished laying she filled the hole by standing on her forefeet as before, and using her hind ones as shovels. When about one inch of earth was thrown in, she would get in and tread it solid. This continued until the hole was filled, when, after smoothing and treading carefully, she crawled away. She measured nine inches wide by twelve long. The soil where she dug was very sandy.

Anecdote of the Sparrow-hawk. — An old gentleman once told me the following incident of this bird and I can vouch for its truth: "One day as I was sitting by my window looking over the thriving little town of D——, my attention was turned towards a tame cat which was crossing the street, and bearing a large mouse in her mouth, evidently a treat for her young. But she came well nigh losing it, for a sparrow-hawk came flying over, and seeing the mouse in her mouth, made a sudden swoop and tried to seize it with its talons, but did not succeed. The hawk continued its attempts until they reached the opposite side of the street, when the cat disappeared under the sidewalk, and the hawk flew off into the forest." — T. Allison, *De Witt, Iowa.*

Hybrid Fowls. — By chance I have had in my possession for two or three years a pair of hybrid fowls, bred from an ordinary dung-hill cock and a guinea hen. Not having had the means of ascertaining whether this is an isolated instance worthy of note, I have addressed these few lines to you, since if the case is worthy of attention I shall be pleased to give you any information concerning them that is in my power. — Ward Bachelor, *Waverly, Pa.*

[If not too late we should be pleased to have a description of the fowls. Will our readers inform us of any similar cases they may have authentic knowledge of. — Eds.]

THE RUBY-CROWNED KINGLET. — All our standard works on American ornithology describe the Ruby-crowned Kinglet as presenting little or no sexual differences in color, both males and females being said to possess the red crest when mature; those without it being regarded as young or immature birds. I have long questioned whether this is so, but have not of late had an opportunity of arriving at a satisfactory conclusion. Mr. Jillson, writing to me recently about them, says he thinks there is some mistake about them. He says "as far as I know, all naturalists describe the female as having the red on the head. I have taken from three to a dozen every season in May; have dissected most of them but have never found one that had the red that was not a male. I have never taken any without the red until after the former had all, or nearly all, gone north. Those without the red have always proved to be females, and I have never heard one of them sing; but I do not think I ever shot one with the red crown but that I had heard it sing."

What now is the experience of others? Does the female ever have the red crown? — J. A. ALLEN.

THE CROCODILE IN FLORIDA. — Professor Wyman describes, in the "American Journal of Science" for January, the skull of a true Crocodile shot near the mouth of the Miami River, Florida. He remarks that "it has been shown by different paleontologists, especially by Dr. Leidy and Professor Cope, that several species of Crocodilians existed in North America during the Cretaceous and Miocene periods, all of which became extinct. At the present time two living species of true Crocodiles, viz: *C. acutus* and *C. rhombifer*, are known in South America, and both range as far north as Cuba and San Domingo, but we have not been able to find a record of the presence of either of them within the limits of the United States, the Alligator being the only representative of the family to which it belongs." He considers the Florida specimen as the *Crocodilus acutus*.

HOUSE SPARROW (*Passer domesticus*). — The recent introduction of this interesting and useful little foreigner to Boston, with a view to his naturalization and domestication throughout our New England States, appears, I opine, in a fair way of accomplishment, and to call for some notice and gratulation. Although we cannot restrict him to city life, it is certain that he will instinctively discover for himself locations suitable to his peculiar habits and economy. Already he has appeared in some of the suburban towns. In passing a few days since through one of the most frequented streets of this village, I was unexpectedly surprised and gratified in recognizing a merry party of six of our new English friends of both sexes; some picking out the half digested grain among the horse droppings on the road; others, merrily chirping and arranging their toilets on the trees of an adjacent pear orchard, among which a quantity of loose stable litter had been strewn; in such circumstances they appeared to be quite at home and vastly enjoying themselves. He is a social, bold, cunning and gregarious bird; domestic, yet impatient

of restraint, and his loquacity and pugnacious disposition are at times quite amusing, and if successfully acclimated, we may expect eventually to find him generally dispersed among our villages and farmsteads, as well as on the crowded streets of our cities, where his presence may be encouraged and his person protected by wise and salutary laws. Some little attention to his natural wants during our usually severe and protracted winters, when the earth is bound by frost or enveloped with snow, in the shape of a few daily handfuls of grain and a snug shelter under the eaves of the barn or outhouse, would, I apprehend, be the extent of his demands on our sympathies, and with his cheerful company and active service during the ensuing season in exterminating those insectivorous pests of the garden and orchard, the curculio, cankerworm (*Et sui generis*), would be found an ample remuneration, and a more plentiful supply of sound apples and luscious plums we might expect as one of many other beneficial results. — J. R. COLLETE, *Somerville, Mass.*

DIMORPHISM IN THE HIGHER WORMS. — The distinguished Swiss naturalist, M. Claparède, in a recent article: "Researches on the Annelids," published in the "Bibliothèque Universelle, Archives des Sciences Physiques et Naturelles," gives an abstract of his studies of the annelids of the Gulf of Naples, in which he confirms the discovery of Malmgren (noticed in the NATURALIST, Vol. iii, p. 494) that Heteronereis is a form of the old genus Nereis. He states that Ehlers, in 1867, in his "Die Borstenwürmer," a work on the higher annelids, has shown the undoubted specific unity of *Nereis cultrifera* and *Heteronereis lobulata;* of *Nereis pelagica*, and *Heteronereis grandifolia;* of *Nereis Dumerilii* and *Heteronereis fucicola;* of *Nereis vexillosa*, and *Heteronereis Middendorfii;* of *Nereis fucata* and *Heteronereis glaucopis*, and another Heteronereis form to *Nereis Agassizii* and *Nereis virens*. He thinks the Nereids are transformed into Heteronereids at the time of sexual maturity. Claparède states, however, that all the species of Nereis do not have a Heteronereid form, as the species of Nereis far exceed in number those of the so-called genus Heteronereis.

He thus concludes: "The fact of animals presenting two sexual forms is not entirely new. The beautiful observations of M. M. Leuckart and Mecznikow, and those of M. Schneider on the *Ascaris nigrovenosa*, have made us acquainted with analogous cases among the Nematodes, where one of the generations, it is true, is hermaphrodite, and the other presents separate sexes. But, among the Acalephs, certain Geryonidæ (*Carmarina*), according to M. Haeckel, and among the Nematodes, the *Leptodera appendiculata*, according to M. Claus, present two sexual forms, for each of which '*gonochorisme*' is the rule. The history of the Axolotls, which M. Dumeril has acquainted us with, offers certain points of analogy with that of *Nereis Dumerilii*."

The bearing of these remarkable discoveries, as well as those of the dimorphic forms of insects, on Darwinism, and especially Professor Cope's theory of the origin of genera, is startling, and strongly confirmatory of the latter phase of the theory of evolution.

DISPOSAL OF THE PLACENTA.—Noticing in the NATURALIST passing allusions to this subject, I desire to add my testimony in the case. I have closely observed cats and dogs in the act of parturition, and am in position to affirm that these animals devour the afterbirth. It would rationally be inferred from the fact that a cat's bed, no matter how numerous her progeny, shows nothing but a few blood stains, and those made by the liquor amnii. The lying-in of a bitch that I watched through the whole process, and had under observation for some days afterward, furnished some other interesting particulars. The uterus expelled its contents at short intervals, one fœtus at a time, each emerging entire, without rupture of the membranes, and so of course, accompanied by the secundines intact. The mother at once seized the fluctuating mass with her teeth, tore it open, spilt the water, and shook out the puppy. She then hastily took the placenta and membranes in her mouth, chewing and swallowing convulsively until the whole mass was in her throat, the funis meanwhile hanging out of her mouth with the puppy still attached, its abdomen touching her muzzle. At this point she began to bite the cord, about an inch from the umbilicus, and chewed it off, using not the incisor, but the canine teeth. A few drops of blood followed the severing of the cord; the puppy was left to its own resources, while the mother rested, apparently asleep, after her pain and fatigue. The process was substantially repeated in each instance. In this accouchment there were nine puppies; consequently some idea of the amount of flesh taken into the mother's stomach may be formed.

Here are two points for consideration. In the mode of severing the cord we have a fine example of the instinct, or perhaps rather necessity, that effects laceration, instead of clean cutting, and thus obviates hemorrhage; for lacerated vessels do not bleed. It raises a question now extensively discussed by obstetricians; and, indeed, one might ask with propriety, was Cain's navel-string tied? Secondly, it is probable that the secundines are not wasted, but on the contrary furnish sustenance to the mother for a time. In the case to which I have special reference the mother did not leave her bed for forty-eight hours, nor could she be induced to take food brought to her during that time. The mass was certainly digested, and its nourishment assimilated, as was evident from the appearance of what was voided on the third day.—ELLIOTT COUES.

SUMMER RED BIRD.—I have just learned, through Mr. Winfield Stearns, of Amherst (in a letter to the NATURALIST), that a specimen of the Summer Red Bird (*Pyranga æstiva*), was shot in August, 1867, in that town, this making the third instance now known of the capture of this southern bird in this state.

Much is doubtless still to be learned respecting our Massachusetts birds, especially in regard to the frequency of occurrence of many of the rarer species. It is to be hoped that those having facts of interest respecting such species will see fit to report them in the NATURALIST.—J. A. ALLEN.

THE OSPREY (*Pandion haliaëtus*). — Mr. Allen, on page 569 of Vol. iii of the NATURALIST, refers to the desertion of the seaboard of Massachusetts by this bird. I will relate an incident which came under my observation some time since showing that the Osprey is still, or recently, a very near neighbor and affording some expectation of his return to our coasts where conditions suitable to his peculiar habits still exist.

Walking from Bristol to Warren, R. I., in May, 1868, I noticed with a pleasant surprise an eyrie of a pair of these birds on the denuded top of a stunted oak or butternut, at an elevation, judging from my distance, of less than twenty feet from the ground, located near a solitary farmstead, about half a mile distant on the right of the turnpike, and with but few other trees of dwarfish growth scattered at intervals around. The female bird appeared to be busily engaged in collecting material and repairing her nest; the male meanwhile sedulously pursuing his piscatory avocation over the adjacent bay. I presume I could not have been mistaken in identifying the species on this occasion, having had some years previous a fair opportunity of studying the habits of these birds on the estate of my friend, Dr. Parmley, near Shrewsbury Inlet, New Jersey. — J. R. COLLETE, *Somerville, Mass.*

THE GREAT AUK. — The statement (Amer. Nat., iii, p. 539) that "the Great Auk or Gare-fowl, fortunately for itself did not live long enough to receive more than one scientific name" is incorrect. I give several (Proceedings of the Academy of Natural Sciences, Phila., 1866), and believe others might be found. The tips of the wings are not white, as stated (l. c.), the primaries not being thus marked. I should judge "less than thirty specimens of the egg . . . . now preserved" (op. cit. p. 550), to be an underestimate. Mr. Robert Champley (Annals Mag. Nat. Hist., 1864, p. 235—fide Hartl. Jahresb. 1864, p. 27), records fifty-three. Those who hesitate to credit comparatively southern localities for the species should consult the paper of one of the highest authorities upon the subject, Professor A. Newton. (Ibis, Oct., 1862). Some of Nuttall's observations are more poetical than reliable. Lastly, we have no proof that the Great Auk is extinct; the negative evidence in the case is not so weighty that Professor Newton could not say with propriety "I think there is yet a chance of the Great Auk still existing" (ibid., p. 23). — ELLIOTT COUES.

A RARE VISITOR. — A specimen of Pomarine Jager (*Lestris Pomarina*), was obtained by Mr. Vincent Barnard on the fourth of July last, on the Susquehanna River at Peach Bottom, Lancaster County, Penn. An adult bird of the same species was procured, during the summer of 1840, at Harrisburg on the same river by Professor Baird. When it is remembered that adults of this species seldom come within the limits of the United States, even in the severest winters, young birds only making their appearance along the New England Coast, their occurrence in midsummer may well be considered as quite remarkable. ⁂

THE COW BIRD. — In the second number of "Nature," Professor Newton has an uncommonly interesting and suggestive article on the variation observed in Cuckoos' eggs, which seems to depend upon, or to be in some way connected with the characters of the eggs of the birds selected by the parasite as the foster-parents of its offspring. Has anything of the sort been determined regarding the eggs of the Cow-bird? Do they vary, in the first place, to anything like the extent that the Cuckoo's do; and secondly, do they ever tend unmistakably to assimilate in marking to the eggs of birds usually selected by the Cow-bird as its dupes? Or, again are the birds so chosen, those whose eggs have any special resemblance to a Cow-bird's? It is not always so, I know; but is it so sometimes, frequently, or usually? The subject is worthy of the attention of our ornithologists, from whom it would be well to hear. — ELLIOTT COUES.

OCCURRENCE OF THE BROWN PELICAN IN MASSACHUSETTS. — Since writing "Notes on Some of the Rarer Birds of Massachusetts," I have received, through the kindness of Mr. Martin, further information respecting the Pelicans mentioned in the February number of the NATURALIST. The gentleman who saw the flock referred to there, and who fired at them, writes that the number was five instead of thirteen, as at first erroneously reported, and that they were the *smaller brown species* (*Pelecanus fuscus*) instead of White Pelicans. They came in from the sea, apparently much fatigued, and alighted on the beach near the Sankaty Head lighthouse, where they remained till driven away by being fired at. A White Pelican seems, however, to have been recently killed on Brant Point, Nantucket, as previously stated. The Brown Pelican I have not known to occur previously so far north. — J. A. ALLEN.

THE CHIPMUNK. — One of our chipmunks was noticed a few days ago busily nibbling at a snake that had been recently killed. He could hardly be driven away, and soon returned to his feast when his tormentors had withdrawn a short distance. Does the *Tamias striatus* in other regions possess such carnivorous propensities? — A. J. COOK, *Lansing, Mich.*

ALBINO RODENTS. — In the back yard of a small restaurant in this city is kept a beautiful albino squirrel, of the black and gray species (*Sciurus Carolinensis* Gm.). It was taken in Central Wisconsin, where another was killed at the same time. There is an albino rat at a bird-store in town. — W. J. BEAL.

CONCHOLOGICAL SECTION OF THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA, *Nov.* 4th, 1869. — Mr. Tryon called the attention of the members to specimens of *Amnicola grana* Say, from Carter County, Missouri, presented this evening. This very minute species was apparently unknown to Professor Haldeman, who in his monograph of the genus, merely quotes Say's original description and citation of locality and does not figure it. The species was for years considered a doubtful one, until Mr. Tryon had discovered it, six or eight years ago, existing in considerable numbers in ditches in the southern part of the city of Philadelphia.

Mr. T. distributed specimens to many of the American Conchologists, most of whom informed him that it was new to their collections. The donation this evening (Nov. 4) indicates that the species has a large area of distribution, and has probably been overlooked by collectors under the supposition that it was merely the young of some larger species.

At the meeting held December 2d, Mr. W. L. Mactier called attention to a specimen of *Dolium melanostoma* Jay, presented by him this evening. The locality of this shell still remains a mystery, although it has been recently assigned to Japan. Mr. M. also presented a nearly perfect specimen of *Voluta Junonia* and remarked that it was the rarest of American *Volutidæ*, and was found in the Gulf of Mexico.

Mr. Tryon referring to his remarks made at a former meeting in refutation of Dr. Gray's opinion that *Crepidula plana* Say, is identical with *C. fornicata* Linn., stated that additional evidence of their non-identity had recently been presented by Mr. George H. Perkins, who in a recent paper states "that the ovi-capsules of *plana* are broader, shorter, and thinner than those of *fornicata*, and the ova are differently situated."

GEOLOGY.

Further Evidence of the Affinity between the Dinosaurian Reptiles and Birds. — Professor Huxley reviewed the evidence already cited by himself and others (especially Prof. E. D. Cope), in favor of the ornithic affinities presented by the Dinosauria; and discusses at length the recently ascertained facts which bear upon this question, some of the most important of which are derived from the species described by him in the preceding paper under the name of *Hypsilophodon Foxii*. He summed up his paper by a comparison of the different elements of the pelvic arch and hinder limb in the ordinary reptiles, the Dinosauria and Birds, and maintained that the structure of the pelvic bones (especially the form and arrangement of the ischium and pubis), the relation between the distal ends of the tibia and the astragalus (which is perfectly ornithic), and the strong cnemial crest of the tibia and the direction of its twist, furnishes additional and important evidence of the affinities between the Dinosauria and Birds.

Sir Roderick Murchison, who had taken the chair, enquired as to the habits of the Hypsilophodon. Mr. Hulke mentioned that Mr. Fox had several blocks containing remains of a large portion of the Hypsilophodon, all procured from a thin band of sandstone near Cowleaze Chine. On one the pelvis is almost entire, as well as the right femur, the tibia, which is longer than the femur, four long metatarsal bones, and an astragalus. All the long bones are hollow. Portions of at least eight individuals have been found in the same bed. Mr. Seeley doubted whether these animals should be called reptiles at all, as they seemed to him to form a group distinct alike from reptiles, birds, and mammals, but occu-

pying an intermediate position. In the hinder limbs of Pterodactylus the analogies were closer with mammals than with birds. He thought it possible that the peculiar structure of the hinder limbs of the Dinosauria was due to the functions they performed rather than to any actual affinity with birds. The President, in reply, stated that Hypsilophodon, from the character of its teeth, probably subsisted on hard vegetable food. He expressed a hope that Mr. Fox would allow a closer examination of his specimens to be made. He was unable to agree with Mr. Seeley's views. He was inclined to think that the progress of knowledge tended rather to break down the lines of demarcation between groups supposed to be distinct than to authorize the creation of fresh divisions. — *Nature, London.*

Fossil Horse in Missouri. — In the Transactions of the St. Louis Academy of Science (Vol. ii, p. 418), Professor Swallow announced the discovery of horse remains in the altered drift of Kansas.

I have now the honor to announce that similar remains have recently been discovered in a well at Papinville, Bates County, Missouri. Mr. O. P. Ohlinger procured a tooth at the depth of thirty-one feet from the surface, resting in a bed of sand beneath a four inch stratum of bluish clay and gravel. Above the last was thirty feet ten inches of yellowish clay reaching to the surface. Beneath the sand, containing the tooth, was a gravel bed five feet in thickness, consisting mostly of rounded pebbles resembling river gravel, generally hornstone, many partially, and some firmly adhering together. Other pebbles shown me from the same bed were of iron ore, coal and micaceous sandstone. I was farther informed that some remains of fluviatile shells were found. I sent the tooth to Professor Joseph Leidy of Philadelphia, and he pronounced it to be the last upper molar of a horse, probably an extinct species.

From a similar gravel bed on the banks of Marais des Cygne, a fragment of a tusk was given me resembling very much that of a mammoth. Its whole length was said to be seven feet four inches. About ten miles above Papinville, the banks of Marais des Cygne River appear to be of a similar formation to the well of Ohlinger, consisting of about twelve feet of brown sandy clay resting on ten feet of blue clay with many pebbles of worn gravel at the lower part.

These gravel beds I consider as of more recent age than the drift, but older than the bluff or loess, and regard them as altered drift. They seem rather to abound on the Osage and its tributaries, and are often reached in digging wells.

The tooth from Maysville, Kansas, was found in altered drift at a depth of forty-five feet from the surfaces.

Dr. Albert Koch exhumed the famous *Missourium* (*Mastodon giganteus*), from a bed of gravel and clay on Pomme de Terre River, twenty feet below the surface. In these beds of altered drift we may therefore expect to find many interesting remains of mammals. — G. C. Broadhead (*Read before the St. Louis Academy of Science, Nov.* 15, 1869).

SUDDEN DRYING UP OF STREAMS IN NEVADA. — In my article on the "Truckee and Humboldt Valleys," I casually call attention to the intermittent character of the mountain streams in that region. I state that they "run freely, even boisterously, during the night and early morning, but dry up totally in the lower part of their course by noon." My offered explanation was rather a surmise than a conclusion. I had at that time seen no other. I have just observed, however, a statement of the fact and a theory to account for it. I refer to an article by Mr. Robert Brown in the January number of the "Country Gentleman," upon "The Forest Trees and Forest Life of North-west America." He says "these streams are hid in high mountains, and the sun is not of sufficient power to melt the snow which forms their volume until late in the day, when they gather force, and again decrease after sunset until they are almost dry."

This solution of the mystery is very plausible and doubtless correct as regards the streams which came under Mr. Brown's observation. It will not apply so well, however, to those of the West Humboldt Mountains, of which I wrote. At the time my attention was drawn to the subject there was no snow upon the range, even the high summit of Star Peak being perfectly bare. Had there been snow, I think the heat of the sun in August was sufficient to melt it any time in the day. I confess that my own offered explanation does not account for the great volume of water in the streams. Although the subject has no direct connection with natural history, I have ventured to call your attention to it in order, if possible, to draw out a theory which will meet the facts. — W. W. BAILEY.

QUATERNARY DEPOSITS. — During the summer of 1865, whilst digging a pit for the foundation of a bridge abutment on the Pacific Railroad, four miles north of Pleasant Hill, Missouri, after passing through soil and dark clays at the depth of twelve feet, a bed of gravel and decomposing remains of fresh-water shells was reached, from which I obtained the tooth of an extinct species of ox.

In the year 1868, whilst prosecuting some geological examinations in Moultrie County, Illinois, I found in the bank of Kaskaskia River, the skull, with part of the vertebral column of an ox (probably *Bos latifrons*). The distance across the skull between the roots of the horns measured twelve inches, and the same between the eyes. The horns were short, thick, and but slightly curved forward and upward. On the bank above there were trees growing two feet in diameter. The bones were surrounded by dark clays and debris.

Besides remains of mammalia, bones and sticks of wood have often been found in modified drift at twenty feet or more beneath the surface. In North Missouri, sticks of wood have been found at a depth of seventy-five feet, part of a grape-vine at forty feet, and in Illinois a piece of cedar has been obtained from more than a hundred feet beneath the surface. In Nevada, Missouri, a walnut log two feet thick was dug up from

a depth of sixteen feet; and four miles north, charred wood and a bivalve shell from a depth of nineteen feet.

It may not be improper here to state that boulders and many rounded pebbles of granite, sienite, greenstone, etc., with accumulations of drift sands, abound along the north line of Missouri, and are even abundant near the line of the Hannibal and St. Joseph Railroad; further south they are more rare, being scarce near the Missouri River. In Sullivan County, Missouri, I have observed a granite boulder twenty-five feet in diameter; in Monroe County, a greenstone boulder, three feet in diameter. Near the Missouri River one is rarely found more than a foot in diameter. In Osage County, Missouri, I have only found one small granite boulder, and found none in the upper river counties on the south. The Missouri River sandbars abound* in small, rounded pebbles of mostly granite, sienite, hornstone, greenstone, lignite and quartz rock, with pebbles from neighboring rocks; all the first named pebbles are borne down from far up in the mountains.

The absence of granitoid rocks in the accumulations along the Osage and its tributaries may be sufficient evidence to place the era of these deposits in a more recent period than that of the modified drift of North Missouri. They may belong to the older loess or bluff, and we may conclude the horse, ox, mammoth and mastodon to be coexistent. It is even probable that they may have roamed America during the epoch of the mound builders. — G. C. Broadhead, *St. Louis, Mo.*

New Mosasauroid Reptiles. — Professor Marsh has recently published in the "American Journal of Science," a notice of four new reptiles, belonging, or allied, to Mosasaurus, from the Greensand of New Jersey. He remarks that "a striking difference between the reptilian fauna of the Cretaceous of Europe and America is the prevalence, in the former, of remains of Ichthyosaurus and Plesiosaurus, which here appear to be entirely wanting; while the Mosasauroids, a group comparatively rare in the Old World, replace them in this country, and are abundantly represented by several genera and numerous species.

Scolithus a Sponge. — Mr. E. Billings has referred the supposed casts of worm burrows, named Scolithus and Arenicolites, and found in Silurian rocks, to the sponges. He believes that these ancient sponges, at least many of them, lived in the sand or soft ooze of the ocean's bottom, with their sometimes wide and trumpet-shaped mouths, just even with or a little elevated above the surface. — Scientific Opinion.

ANTHROPOLOGY.

Relics from the Great Mound. — I send in this letter a perforated shell disk and an oblong bead. They were found with many others in

* Granite and other igneous pebbles are found further to the south than Illinois.

removing the "big mound" in this city. The grave was seventy feet long, eighteen feet wide, and twenty-five feet below the surface; the bodies were in a sitting attitude facing the east; the bones are nearly decayed and will crumble when exposed to the air. I have a lock of long black hair which was on one of the skulls; I also obtained from the same head two copper ornaments, shaped alike, which were behind the ears and beneath which were the oblong beads, one of which is enclosed; the copper ornaments are shaped like the bowl of a large tablespoon, from the convex surface of which extends a long, sharp horn. Two large conch shells were also found which are in my possession. — T. T. RICHARDS, *St. Louis, Mo.*

[On page 256, Vol. I, of the *Transactions of the Chicago Academy of Science*, Colonel Foster mentions the finding of the "disks," "beads," etc., in the grave on the mound, and figures one of the "disks," which on the authority of Dr. Stimpson he considers as made from the shell of *Busycon perversum*, often found in connection with the mounds. Colonel Foster also states that a quantity of small shells *Marginella apicina*, from the Gulf of Mexico were also found. The ear ornaments of copper mentioned by Mr. Richards, are probably the same as those mentioned by Colonel Foster as "two copper vessels, formed like a spoon-bowl."

We have also received a number of the disks (all with holes through the centre) from Mr. Joseph F. Tucker, of Chicago, who states that they were found as described by Mr. Richards. We would like to publish carefully made figures of the ear ornaments in the NATURALIST.

Can any one inform us whether the skulls found in this grave on the "Great Mound" have been compared with those of undoubted mound skulls? For there seems to be much uncertainty relating to this mound. Was it really formed by the mound builders, or even used by them, or were the skeletons found there of the present Indian race? It will be remembered that Professor Smith, of St. Louis, who watched the leveling of the mound, was satisfied that it was a river deposit, and not an artificial mound. — F. W. P.]

THE DEATH OF MICHAEL SARS, the distinguished Naturalist and Professor at the Royal University at Christiana, Norway, was noticed in the last number of the NATURALIST. Since that notice was written we have learned with sincere regret that Professor Sars leaves a family of six children in very impoverished circumstances. In view of the fact that American zoologists are deeply indebted to Professor Sars for the light he has thrown upon many of the lower forms of animals in the unrivalled investigations embodied in his publications, we feel it a duty to solicit aid for his family. Any remittance, however small, will be welcome and acknowledged, and will be forwarded to his family through the Norwegian minister. — EDITORS NATURALIST.

GEORGE PEABODY. — We have received from Mr. Carl Meinerth, of Newburyport, the finest photograph we have yet seen of Mr. Peabody. It is done by the new form of Mezzo-tint, invented by Mr. Meinerth, and is a copy of the last portrait taken of Mr. Peabody by Mayall of London in 1869.

CORRECTION. — A slight correction needs to be made in the article on "Shavings" in the January number. The "large openings" in the figure of the oak-section spoken of on page 566, are not sections of "spiral ducts," of which there is none in the body of such wood, but of the very different dotted ducts. The shaving figured, moreover, must have been taken from an uncommon stick of oak, not to show the great accumulation of these ducts at the inner margin of each annual zone. The figure shows them only in the second layer and a part of the third.

BOOKS RECEIVED.

Archiv fur Anthropologie. Vol. iii, Parts 1-2. Braunschweig, 1869.

Philosophical Transactions of the Royal Society of London. 4to. Vol. clviii, Parts 1 and 2 1868. Vol. clix, Part 1. 1868.

Proceedings of the Royal Society of London. 8vo. Vol. xvii. (1868-9). Vol. xviii, Pt. 1. 1869.

List of Fellows etc. of the Royal Society of London. 4to. 1868.

Transatlantic Longitude, as determined by the Coast Survey Expedition of 1866. A Report to the Sup't of the U. S. Coast Sur. By Dr. B. A. Gould [Smithsonian Contributions]. 4to. 1869.

Quarterly Journal of Science. Jan., 1870. 8vo. London.

Memoirs de la Societe de Physique et d'Histoire Naturelle de Genere. Tome xix. Pt. 2. 1868. Tome xx. Pt. 1. 1869. 4to.

The Anatomy of a Mushroom. By M. C. Cooke. [From Popular Science Review, Oct., 1869.]

Le Naturaliste Canadien. Quebec. Vol. ii, No. 2. January.

Botanical Notes. By D. A. P. Watt. [From the Canadian Naturalist.]

American Journal of the Medical Sciences. Jan., 1870. 8vo (quarterly). H. C. Lea. Phila.

Half Yearly Abstract of the Medical Sciences. Vol. 50. Jan., 1870. H. C. Lea. Philadelphia.

An Address on the occasion of the Hundredth Anniversary of the Birth of Alexander Von Humboldt. By James P. Luse. Read before the New Albany (Md.) Natural History Society.

Petites Novelles Entomologiques. Nos. 13-15. Jan., 1870. Paris.

American Entomologist. Vol. ii, No. 2. Dec. and Jan. Studley & Co. St. Louis.

Scientific Opinion. January 12-26. London.

Canadian Entomologist. Toronto. Vol. ii, No. 4. January.

Stanley's Microscopic Catalogue. London.

Preliminary Field Report of the United States Geological Survey of Colorado and New Mexico, conducted under the authority of Hon. J. D. Cox, Secretary of the Interior. By F. V. Hayden. 8vo. Washington. 1868.

Contributions to Zoology, published by the Royal Zoological Society (*Natura Artis Magistra*), Amsterdam. 1859, 1869. Folio. Notice sur des Debris de Cheloniens faisant partie des Collections du Musee royal d'Histoire Naturelle et provenant des Terrains Tertiaires des Environs de Bruxelles; par M. A. Prendhomme de Borre. 8vo, pp. 8.

Hardwicke's Science Gossip. January, February. London. Also bound volume for 1869.

Land and Water (weekly). Nos. 202-207. Dec. 4 — Jan. 8. London.

News List and Index. Jan. 1st. London.

The Academy. No. 4. January 8. London.

The European Mail (weekly). No. 5162. January 13. London.

Illustrated Bee Journal. Vol. i, No. 2. Indianapolis. $2 00 a year.

Transactions of the Chicago Academy of Science. Vol. i. Part 2. 1869. Royal 8vo. 1869.

Third Report of the Commissioner of Fisheries of the State of Maine. 1869. By Charles G. Atkins. 8vo, pp. 48, and lithograph of Black Bass. Augusta, 1870.

American Journal of Conchology. Vol. v, No. 3. Philadelphia. (10 per annum.)

The Molluscan Fauna of New Haven. By George H. Perkins. 8vo pamphlet. [From Proceedings of Boston Soc. Nat. Hist., Oct. and Nov., 1869.]

Current Numbers of *The Atlantic Monthly, Overland Monthly, Putnam's Monthly, Appleton's Journal, Packard's Monthly, Phrenological Journal, Every Saturday, Young Folks, Riverside Magazine, Old and New, Harper's Bazar, Frank Leslie's Illustrated Paper, Practical Farmer, The Nation, The Citizen and Round Table, College Courant, New York Independent, New York Mail, Baltimore Gazette, New Jerusalem Messenger, Christian Union, American Bee Journal, Journal of the New York State Agricultural Society, Moore's Rural New-Yorker, Every Saturday, Boston Cultivator, The United Presbyterian, Newburyport Herald, Salem Gazette, Hearth and Home, The Fireside Favorite, American Agriculturist, Western Monthly, American Journal of Dental Science, Boston Medical and Surgical Journal, American Journal of Pharmacy, Dental Cosmos, Maine Journal of Education, Chicago Medical Examiner, The Rural Carolinian, Southern Farmer, San Francisco Scientific Press, St. Louis Journal of Agriculture, Maine Farmer, Medical Gazette, American Stock Journal, Michigan Teacher, Journal of Materia Medica, Haverhill Gazette, Manufacturer and Builder, Chemical News, Albany Cultivator, Scientific American, Littell's Living Age, American Journal of Numismatics, St. Louis Weekly Mail, Journal of the Franklin Institute, York County Independent, Louisville Courier-Journal, Wisconsin State Journal, The People, Prairie Farmer, The Horticulturist, Salem Register, New Jersey Enterprise, Medical Gazette, Medical News, Medical Investigator, Pacific Medical and Surgical Journal, California Medical Gazette, American Educational Monthly.*